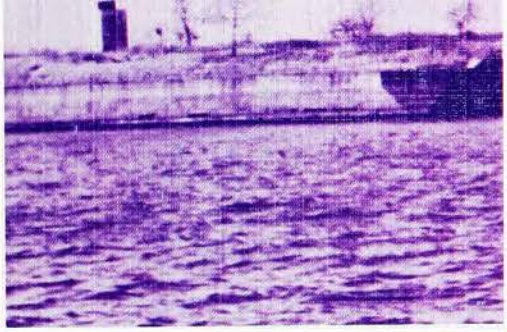

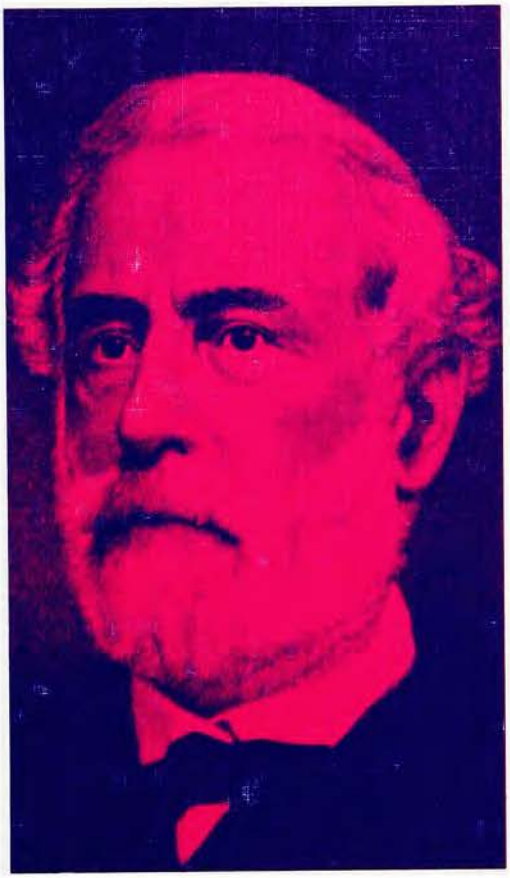

The Mid-Atlantic Engineers: A History of the Baltimore District

U.S. Army Corps of Engineers, 1774-1974

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The Mid-Atlantic Engineers: A History of the Baltimore District U.S. Army Corps of Engineers, 1774-1974

by
Dr. Harold Kanarek

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Harold K. Kanarek, a specialist in twentieth century American history who earned a Ph.D. degree at the University of Virginia, has taught history at Hiram College and George Mason University. His previous publications include "The Pennsylvania Anthracite Strike of 1922" in *The Pennsylvania Magazine of History and Biography* (April 1975); "Disaster for Hard Coal: The Anthracite Strike of 1925-26" in *Labor History* (Winter 1974); *A Monument to an Engineer's Skill: William P. Craighill and the Baltimore Harbor* (April 1976); "The U.S. Army Corps of Engineers and Early Internal Improvements in Maryland" in the *Maryland Historical Magazine* (Spring 1977).

FOREWORD

The US Army Corps of Engineers has played a vital role in the development of our nation, dating back to the Revolutionary War. In fact the first known Corps project in the Baltimore area was the building of Fort McHenry. No one at the time could predict just how successful this project would be, but historians have recorded the fierce bombardment of Fort McHenry by the British during the War of 1812. Fort McHenry saved the city of Baltimore. The stirring account of the battle by Francis Scott Key, who was on board a British ship trying to arrange the release of an American prisoner of war, was written down in verses of "The Star Spangled Banner."

Though much of the early Corps work in the Maryland area was for national defense, Corps personnel also assisted in private and public efforts to develop the nation's transportation system in this area. The assistance of Army engineers in construction of communications networks in the Maryland area—roads, railroads, canals, and navigation channels—was an important influence on the economic development of the state.

Throughout the years the Corps has performed military construction, been assigned responsibility for water navigation, flood control, water resources management, and the unique mission of providing drinking water for the city of Washington, DC.

The Baltimore District, with an illustrious record of past accomplishments, looks to future opportunities to serve our nation.

G. K. WITHERS
Colonel, Corps of Engineers
District Engineer

PREFACE

I am deeply grateful to the research staffs at the Library of Congress, the National Archives and the Washington Record Center for their assistance and cooperation in making the research and writing of this volume an extremely pleasant experience.

The study facilities at the Library of Congress provided the necessary space and atmosphere conducive to scholarly writing.

I would particularly like to thank Thomas Lipscomb of the National Archives whose knowledge of Record Group 77 (Records of the Corps of Engineers) and personal help over many months facilitated my work and aided me in uncovering much valuable material.

Without the commitment of the Baltimore District of the Corps of Engineers and its Historical Committee this volume could never have been produced. The staffs of every branch of the District were always friendly and cooperative. Michael J. Lawrence, Gary A. Loew, Larry Jones, Joseph F. Boemmel and Elizabeth H. Phipps deserve special mention. Particular credit goes to the Baltimore District Engineer, Brig. Gen. Robert S. McGarry, who took a keen interest in the project and gave much of his time and energy to seeing it to completion. Credit for the layout of this volume goes entirely to Henry G. Dunn, who masterfully coordinated the illustrations and the text to produce a beautiful history. Finally, I owe a special debt of gratitude to Dr. Jesse Remington, Lenore Fine, Dr. Albert Cowdrey and Dr. Charles Walker of the Corps Historical Division for their advice, encouragement, warmth and friendship.

Harold Kanarek
Washington, D.C.
August 1976

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Chapter I
The Army Engineers First Work in Baltimore Building Fort McHenry and the War of 1812

The rich history of the Baltimore District of the Corps of Engineers is characterized by a wide variety of activities from fortification construction and internal improvements, which significantly affected the country's early development, to modern flood-control projects, river basin planning and diverse military construction. Because of Baltimore's strategic location on the Patapsco River, a commercial waterway leading to Chesapeake Bay, the Army Engineers with headquarters in this city—closest of all Atlantic tidewater ports to the Mid-West—have had a tremendous influence on national defense as well as on water and inland commerce since the beginning of the Corps' presence in the area.

II

The Corps of Engineers as a whole traces its beginnings to the American Revolutionary War. On 16 June 1775, the Continental Congress adopted a resolution providing the "Grand Army" with one chief engineer and two assistants. A further authorization of 27 December 1776 allowed Gen. George Washington to organize a Corps of Engineers for a period of six months. The first formal activation of the Corps dates from 11 March 1779. Because the colonies lacked enough properly qualified men, they appealed to the French for expert engineering assistance. In response, the French Royal Corps of Engineers sent four officers across the Atlantic to aid the revolutionary army. On 11 May 1777, Brig. Gen. Louis le Begue du Portail became Commandant of the Corps of Engineers under General Washington.

Disbanded after the Treaty of Paris of 1783 granted the colonies their independence, the Corps of Engineers was not revived permanently until 16 March 1802, when Congress authorized the organization of an engineer corps and the institution of a military academy at West Point, New York. From 1794 until 1802, temporary civilian fortifications engineers, most of whom were French, planned and built the defenses of various coastal harbors. Congress organized the Corps of Artillerists and Engineers to garrison these forts.[1] This is the period during which Army Engineers activity began in Baltimore.

III

Baltimore is situated at the head of the tide on the Fall Line, at the point where the lower Atlantic coastal plain and the Piedmont plateau intersect. Not only does the city have deep water with a free and unobstructed approach to a protected harbor 170 miles inland; soil in the immediate vicinity produces diverse crops and mineral resources.[2]

Nearly one hundred years elapsed between the charter granting Cecil Calvert (Lord Baltimore) the right to colonize the territory between the Potomac and Delaware Rivers,

and the 1729 act of the Maryland Assembly which provided for sixty acres of land to erect the town of Baltimore.[3] The youngest of all Atlantic ports, Baltimore rose rapidly to become a harbor city of major importance. At the outset, tobacco was the primary product shipped from her shores, but the expanding world-wide demand for grain caused many farmers to shift their efforts to growing wheat. By the middle of the eighteenth century, with the opening of transportation routes into the interior, Baltimore was well on her way to becoming a large trade center. As wheat production climbed, flour milling became a major industry of the town.[4]

During the Revolutionary War, Baltimore's commerce and industry received a tremendous impetus. The blockade of Annapolis harbor diverted trade to the town on the Patapsco. In addition, Baltimore became the center of privateering, and those privateers who raided British commerce converted their prizes into lucrative profits. Also during the war, Baltimore shipbuilders began constructing the sharp topsail schooner which became known as the Baltimore Clipper.[5]

Expansion continued during the late eighteenth century. The French Revolution and the Napoleonic wars which followed stimulated U.S. commerce. From 1790 to 1797, Baltimore's shipping tonnage more than quadrupled. Besides tobacco and flour, her exports included corn, beans, peas, lumber, corn meal and flaxseed. By 1800, Baltimore had become the third largest commercial port in the new nation.[6]

IV

The first project undertaken by army engineers in the Baltimore area was the construction and repair of Fort McHenry at Whetstone Point on the Patapsco River in the harbor. Records are scarce about the early building of this star-shaped structure, but it is known that Baltimoreans dug earthworks at the Whetstone Point site in 1776 and mounted eighteen cannons. James Allcock, a Baltimore schoolmaster, probably designed the earthworks, but there are no conclusive documents which definitely prove that he did. By 4 July 1776, upper and lower batteries and been formed. However, the city's defenders did not erect a complete star fort during the American Revolution. It is probable that by November 1779 more than one barracks stood on the Whetstone Point grounds. For the next fifteen years there was no new work. Fort Whetstone gradually deteriorated.[7]

Fears that she might be drawn into another war because of the conflict in 1794 between France and Great Britain caused the fledgling nation to shore up her coast defenses. Protecting the important port of Baltimore seemed essential. Therefore, on 28 March 1794, Secretary of War Henry Knox ordered Maj. John Jacob Ulrich Rivardi, a French artillery engineer, to Baltimore to supervise the fortifying of the harbor. Rivardi, who had come to America during the Revolution, was one of at least seven fortifications engineers the War Department hired temporarily to build the first system of coastal defenses.[8]

Knox estimated that at Whetstone Point the parapets, embrasures and platforms for batteries for twenty-eight guns, a redoubt, two magazines and a blockhouse with barracks would cost $4,225.44. "It will readily be perceived, by the lowness of the estimate," he wrote, "that the parapets of the works intended to be erected are to be of earth." In his opinion, an earth parapet would form a solid defense if the earth were "properly sloped and sodded inside and out, and the seed of knotgrass sown so as to bind the sods and earth together."[9] The blockhouse should be built to hold some fifty men; if the garrison needed enlarging, tents would be used. In order to resist a sudden enemy attack, the redoubts ought to be built to accommodate 500 men. Knox particularly warned Rivardi of the need to construct properly ventilated magazines that would be impervious to dampness. The magazine had to be large enough to hold 150 pounds of powder for each cannon it served. Six-feet-thick wooden casemates on the roof would be "jointed and caulked in such a manner as to be perfectly tight."[10]

Major Rivardi hurried to Baltimore and found a star fort which was never entirely finished, "and the greatest part of the ditch is filled up with earth of the parapets."[11] He complained that Knox's estimate for the fort cost was too low even to repair the old works, let alone to erect the necessary buildings, platforms and carriages the Secretary required. Undaunted, however, Rivardi believ-

ed that the militia would turn out to provide the labor, so that the funds could be used exclusively for purchasing materials.[12] On 20 April 1794, Rivardi left for Norfolk, optimistic that construction of the fort at Whetstone Point would be carried out successfully. "In general, it seems that the citizens are disposed to give every possible assistance; so that I hope the whole plan will be executed for the sum allowed by the Government."[13] He placed Lt. Samuel Dodge in charge of purchasing the materials. Although Dodge lacked engineer training, Rivardi was confident that he was "well calculated to forward the execution of the business." He wished, however, that an engineer "understanding the geometrical part of the business, could be now and then consulted during my absence."[14]

Construction progressed efficiently during the summer of 1794, most of the heavy labor being done by volunteers. By mid-September, Dodge reported that work on the lower battery was nearly complete. But there had been several nagging interferences. Sightseers and cattle had trampled on the sod. Dodge lamented that "they have torn it to pieces in a most shameful manner." Second, carpenters were impossible to hire at the prevailing wage of one dollar a day, so it became necessary to hire unskilled laborers to make and lay the platforms. Finally, illness forced Dodge himself off the job for six days, and intermittently during the summer sickness depleted the labor force.[15]

In May 1795 Alexis de Leyritz succeeded Dodge and remained as engineer in charge for the next three years. However, during his tenure little was accomplished and only $3,000 spent. The fortification—named for James McHenry of Baltimore, who had served as secretary to Gen. George Washington during the Revolution, and who became Secretary of War in 1798—was greatly modified thereafter. In January 1796, Secretary of War Timothy Pickering reported that a battery and barrack were complete and some guns mounted.[16] But new changes were to come.

Secretary of War James McHenry in 1798 dispatched French engineer Maj. Louis Tousard to Baltimore to review construction progress. Tousard, fearing that the fort could not resist a land invasion, proposed enlarging the structure at a cost estimated at $30,000. The next year Jean Foncin, another French engineer, arrived in Baltimore and called for more than a mere enlargement; an abandonment of the crumbling earthen star redoubt and its replacement by a masonry-faced, pentagonal fort. By late July 1799, Foncin's plan was well under way. The engineers built the new masonry works over the remains of the old star fort.[17] Also, during this period citizens ceded to the United States for the fort plots of land measuring more than twenty-six acres.[18]

By the end of 1800 the fort was complete to Foncin's satisfaction. Although Major Rivardi often is given sole credit as the fort's architect, it was really Foncin, along with Dodge and Tousard, who shaped the final product.[19] In the end, Secretary Knox's original construction estimate of $4,225 had never been realistic. By the end of 1795 the War Department had spent three times that sum. From March 1794 through November 1805, Government expenditures on Fort McHenry came to $110,358 or 10 percent of all monies spent on coastal forts. Expenses for 1800 alone amounted to $53,000.[20] Of course, the increased expenditures allowed a structure far more elaborate than Knox originally contemplated. The fort on Whetstone Point was now an enclosed pentagon with five bastions of masonry calculated to hold forty guns. It included a brick magazine, a gun house and a barracks one and a half stories high for two companies of soldiers including officers.[21]

V

At the same time that the War Department issued instructions for constructing a fort to defend the Baltimore harbor, it also decided to strengthen the defenses at the port town of Annapolis, Maryland. In 1794, Secretary Knox placed John Vermonnet, a temporary fortifications engineer, in charge of building a fort there, but no work of any consequence was undertaken until the next decade.[22]

During the summer of 1794 Vermonnet did begin erecting a battery and barracks. He sent back optimistic reports claiming that the works were "very much advanced, and I believe I shall be able to fniish this year."[23] A year and a half later, however, Secretary of War Timothy Pickering submitted a critical statement on the work at Annapolis that

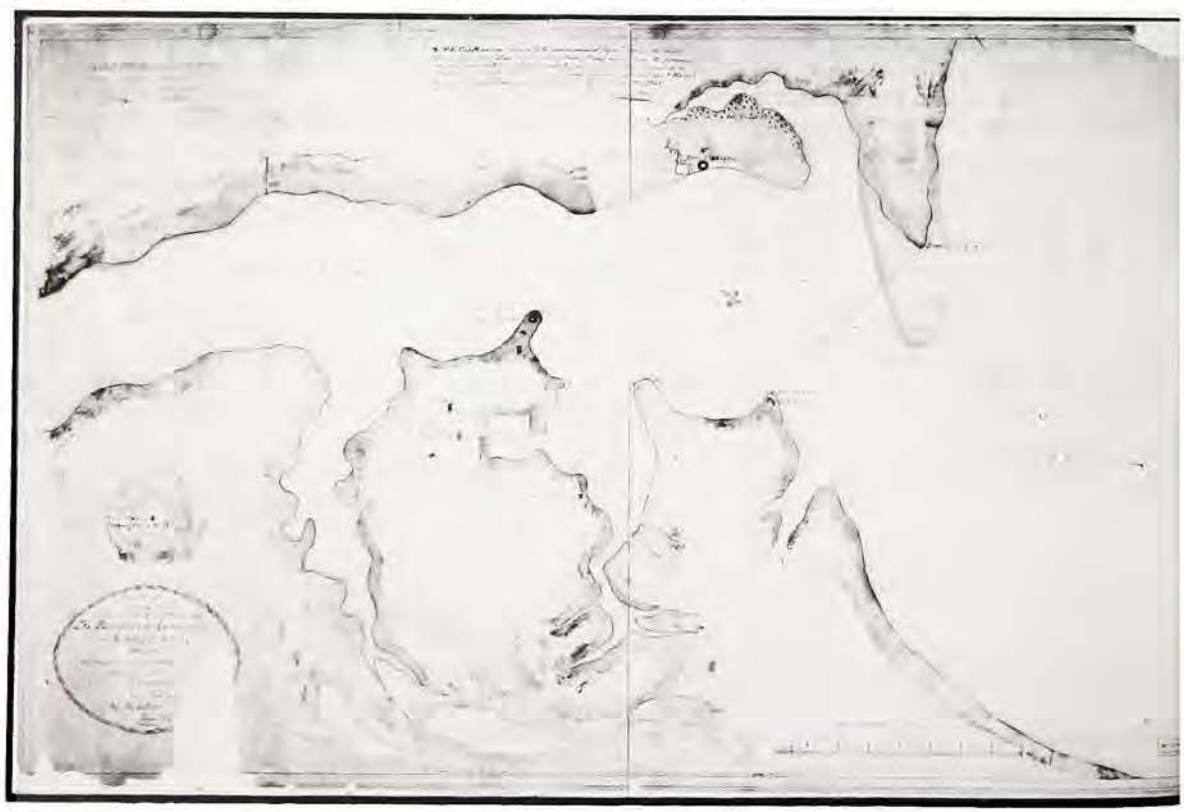
implied little had been done. He branded the original plan of which there are no surviving details, inadequate. Work would have to start from scratch. Apparently Vermonnet had already been relieved of his responsibility.[24] Through 1805 the project never advanced beyond the examination and survey stage, only $3,266 having been spent at Annapolis on defenses in the previous ten years.[25]

With Capt. George Bomford in charge, work was under way in earnest at two sites around Annapolis in 1808 and 1809. (Bomford, a young graduate of the U.S. Military Academy class of 1805, later had a distinguished career in the Ordinance branch.) At the main site he supervised the building of Fort Madison, an enclosed masonry work with a semi-elliptical face and flanks that could hold thirteen guns. The structure also included a brick magazine and a barrack for one company including officers.[26] At Windmill Point at Annapolis, Second Lt. Joseph G. Totten, who later became Chief of Engineers, directed the construction of a small circular masonry battery called Fort Severn designed for eleven cannons. In the rear of the battery were quarters for two companies.[27]

VI

Because of the all-out war between Britain and France, these defenses were not superfluous to a young nation that already had world-wide commercial interests. After 1803, French and British interference with American commerce on the high seas and blockades staggered the United States. Americans became more particularly outraged by the British seizure and impressment of naturalized U.S. citizens from U.S. ships. The nation was torn apart by a desire to avoid war, but at the same time it wanted to protect its trade. President Thomas Jefferson sought to defend U.S. neutral rights by terminating all commerce with Europe. His Embargo of 1807 was a bold attempt to keep the United States out of the European conflict. But the expanding shipping interests of the nation, par-

Outline map of the defenses of Annapolis Harbor as of August 3, 1814.—Library of Congress



ticularly in New England, refused to comply. Bitter opposition within the United States forced Jefferson and Congress to retreat in 1809 by reopening U.S. commerce with all nations except England and France, and in 1811 to resume trade with those two belligerents.

American shipping firms wanted the government to defend their maritime rights, while avoiding a destructive war. In the West and in the South, however, the so-called War Hawks, led by Speaker of the House Henry Clay of Kentucky, pushed for a confrontation with Britain. Many Congressmen from the West blamed the British for stirring up the Indians and demanded that they be expelled from Canada. Southerners, on the other ahnd, saw a war with Great Britain as an opportunity to seize Florida from Britain's ally, Spain. These expansionist desires, combined with the maritime grievances, pushed President James Madison to declare war with Great Britain on 1 June 1812. Behind the war spirit was a pervasive conviction that England had dealt dishonestly with the United States.[28]

VII

Because of the Army Engineers construction of fortifications in Maryland, and especially Fort McHenry, the Chesapeake Bay region, and the city of Baltimore were not entirely defenseless at the outbreak of the War of 1812. But at Baltimore stronger defenses were required. The city was extremely valuable as a center for substantial shipbuilding, commercial trade and privateering. Obviously, for the British the capture of Baltimore would be a heavy blow to the U.S. war effort.

Baltimore was vulnerable to attack from both land and sea approaches. A main route was from the mouth of the Patapsco River at North Point on Chesapeake Bay into the harbor of the main city. However, the peninsula of Whetstone Point split the river in two and on Whetstone Point stood Fort McHenry. The two parts were the Northwest Branch leading into the harbor, and the Ferry Branch becoming the primary estuary of the Patapsco River curving off to the west, but coming within a mile of town. Fort McHenry was ideally situated to sweep its gunfire across the narrow Northwest Branch between it and Lazaretto Point which stood on the other side. An eastern land invasion also posed a threat because of the good road that led from the beaches at North Point right into the city. A western land attack was also possible but would require a march through the Maryland hinterlands.[29]

Although the federal government could afford little money and manpower to shore up Baltimore's defenses, it did become concerned enough in the spring of 1813 to order the twenty-eight-year-old Chief of Engineers, Col. Joseph G. Swift, to send an Engineer officer to that port city to superintend the repairs needed at Fort McHenry.[30] On 20 April 1813, Colonel Swift ordered Cap. Samuel Babcock to reach McHenry as quickly as possible.

Swift was most explicit in his instructions to Babcock as to what he wanted done at the fort and in the harbor generally. He ordered the captain to fill in the bastion at McHenry, raise the wall around the fort to five feet, plan a traverse before the gateway and the magazine, and to platform and mount cannons at the water batteries. He also warned of the need to fortify Lazaretto Point and to protect the Ferry Branch approach down the Patapsco.[31]

Babcock threw himself into the task of bolstering Baltimore's defenses by diligently carrying out all of Swift's recommendations. By 1 December 1813, he reported that he had completed the fortifications in the harbor of Baltimore. At Fort McHenry itself twenty-one guns had been mounted; 24-, 18- and 12-pounders. The contiguous water batteries contained thirty-six more mounted guns including fifteen 32-pounders. Across the Northwest Branch of the Patapsco at Lazaretto Point, Babcock constructed a small parapet; while it had no mounted guns, "in case of attack it would be served with the traveling 18 pounders of the volunteer corps."[32]

To defend against a British attack which by-passed Fort McHenry down the Ferry Branch, Babcock had built a small redoubt one and a half miles west of McHenry designed for ten or twelve guns. Named Fort Covington, this partly revetted work stood sixteen feet high and included quarters for a company of soldiers and a magazine measuring thirty by twelve feet. A brick wall enclosed the rear. One-fourth of a mile to the left of Fort Covington the engineers built a small sod

work named Babcock Battery where they mounted six 18-pounders and five furnaces for heating shot. "After the guns at Covington are mounted," Babcock informed the Secretary of War, "the total number of garrison pieces in the harbor will be seventy-three."[33]

Throughout 1813 and 1814 the British fleet harassed the settlements in the Chesapeake Bay region. On 3 May 1813, they burned Havre de Grace, Maryland. During July 1813 they destroyed small vessels, houses and property along the Potomac and Patuxent Rivers. Using Kent Island as their base, they tormented towns along Maryland's Eastern Shore.[34] But it was the destruction of Washington, D.C. on 24 August 1814, that shocked Baltimoreans into realizing they might be next.

When he learned of the burning of the nation's capital, the mayor of Baltimore immediately appointed a Committee of Vigilance and Safety to arm the citizens and dig the defenses. The Committee named Samuel Smith, major general of the Maryland militia, United States Senator and Revolutionary War veteran, commander of the city's defense forces. On 27 August legions of men began digging a line of fortifications along the eastern edge of Baltimore. Volunteers poured in from every direction, and local banks advanced $663,000 for the cause. General Smith concentrated on protecting the water approaches, correctly calculating that the British would not launch an overland attack from the west.[35] Fortunately, the engineers had worked the previous year at strengthening the sea fortifications. In addition, Smith had begun fortifying Hampstead Hill on the city's east coast in April 1813, when the British fleet first began operations in Chesapeake Bay and could be seen at the mouth of the Patapsco River. Had it not been for these preparations made during 1813, Baltimore might not have survived the attack of the next year.

As September 1814 approached, readying the defenses became frantic. Volunteers dug in a large number of cannons of various caliber and types at Hampstead Hill, an elevation east of the city and north of the Patapsco, along with networks of trenches and redoubts. A boom had earlier been extended across the Northwest Branch from Lazaretto Point to Whetstone Point. This was reinforced by sunken ship hulks, barges and a cannon to further protect the harbor entrance.

By 10 September General Smith had more than 16,000 men covering a network of land and water defenses that guarded the eastern approaches to the city. Small batteries and artillery detachments protected Baltimore's western perimeter. A pontoon bridge laid across the inner harbor in early September facilitated the movement of supplies and men. All indications were that the British could not afford to risk a long march through Maryland's interior and that they would invade from the sea.[36]

On 13 September 1814, the battle of Baltimore began. With the British fleet commanded by Adm. Alexander Cochrane anchored off shore, Maj. Gen. Robert Ross, a distinguished British officer with twenty-five years of service, landed with some 4,700 men at North Point, roughly fourteen miles from the city. After marching for about seven miles Ross met 3,185 Americans led by Brig. Gen. John Stricker. During the ensuing battle Ross was killed. Although Stricker eventually retreated, he exhausted the British and inflicted more than 300 casualties.

At six the next morning Cochrane's fleet of sixteen ships began bombarding Fort McHenry. Maj. George Armistead, 3rd Artillery, commanded 1,000 men inside the fort, and they withstood the fire for twenty-five hours. But the British fleet could not penetrate the harbor. Fire from Fort Covington repulsed a feint down Ferry Branch. And Fort McHenry continued to hold off the enemy valiantly. Fortunately, the magazine, which was not bombproof, was not decisively damaged. While McHenry and the additional fortifications Babcock had constructed repulsed the British navy, the land forces found it too costly to move against the dug-in Baltimoreans. On 14 September the British withdrew.

The most famous and lasting account of the bombardment of Fort McHenry came from Washington lawyer Francis Scott Key, who watched the battle on board a British ship while trying to arrange for the release of an American prisoner of war. Key jotted down the verses of "The Star Spangled Banner," later to become the national anthem.[37]

Thanks to the determined efforts of the

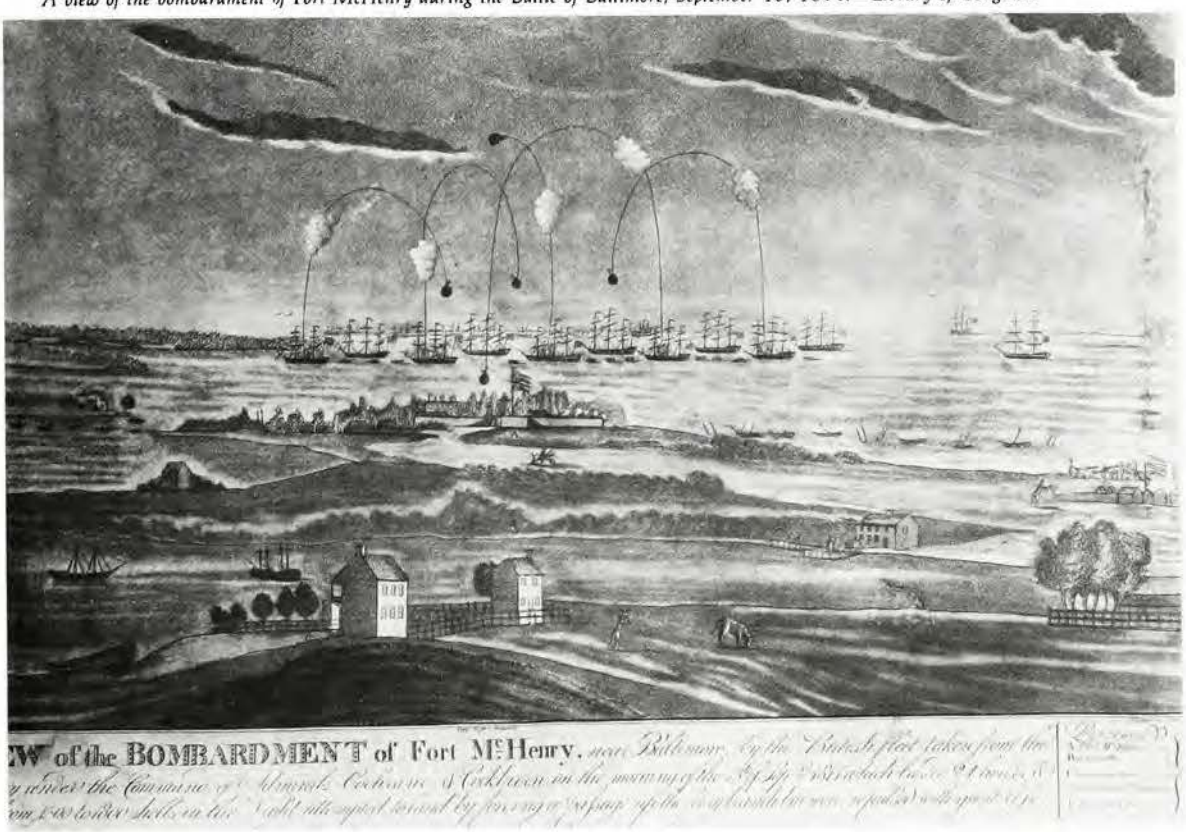
citizens of Baltimore and the Army Engineers, the world's most powerful navy was unable to penetrate the forts and batteries which guarded the sea approaches to the city and which the Army Engineers had constructed. The Engineers' first mission in Baltimore had proved to be a heroic one.

VIII

During the immediate aftermath of the Battle of Baltimore, Babcock continued to strengthen the city's defenses; when he fell ill, French engineer Maximilian Godefroy took charge of fortification work. During the next several years the Baltimore Committee of Vigilance and Safety appealed to the federal government to provide the city with a larger defense force. Their lengthy communication of January 1815 lamented that the regular force now defending Baltimore was inferior and inadequate. A militia force, hastily assembled, the Committee complained, was unsafe, inefficient and expensive. Bravery alone was not enough. Without the "discipline, or a regular army, courage can do nothing, and numbers produce only confusion and disorder."[38] But the urgency of the appeal became lost. The Treaty of Ghent, signed on 24 December 1814, had already terminated the state of war between the United States and England. Besides, the combined voluntary militia and regular troops had proved equal to the task in September 1814.

The Army Engineers, however, continued after the war to vigilantly maintain the fortifications along the Maryland coast. Late in the summer of 1815 the War Department sent to Annapolis Lt. Col. Walker K. Armistead, brother of artillerist Maj. George Armistead who had commanded Fort McHenry during the previous year. Lt. Col. Armistead was to examine the adequacy of the fortifications in the Annapolis area.[39] Earlier, Armistead had inspected Fort McHenry and reported it in a perfect state of repair.[40]

A view of the bombardment of Fort McHenry during the Battle of Baltimore, September 13, 1814.—Library of Congress.



Nevertheless, the British bombardment had demonstrated that Fort McHenry's magazine needed to be bombproofed against future attack. One month after the British retreated, work commenced on correcting this major deficiency. The addition of a thick, arched roof and dense walls produced a magazine better equipped to withstand a heavy attack. Likewise, a strong bombproof wall was built over the well on the parade grounds to protect it in case of future assault. Finally, at the sally port, volunteer labor dug two underground bombproof rooms on each side of the gateway and lined them with heavy brick walls. During 1816, Walker Armistead, noting some erosion on Whetstone Point around the fort, decided to erect a stone wall to enclose the site and prevent further damage. By 1819 all of these improvements were finished. Cost of these repairs between 1816 and 1819 totaled $59,500.[41]

IX

Concern over fortifying the nation's seaports soon after the adoption of the Constitution played a major role in enabling the militarily weak Americans to at least hold Britain to a standoff during the War of 1812. The construction of Fort McHenry by the Corps of Artillerists and Engineers proved decisive to the survival of the city of Baltimore. Equally as vital were the repairs to the fort and the erection of emergency shore batteries which the Corps of Engineers undertook during 1813. While the open earthen breastworks were neither impressive nor durable by modern standards, they served adequately in the summer of 1814. And the major masonry work the engineers erected during the period, along with later improvements, enabled Fort McHenry to survive as an important seacoast fortification for several more decades.[42]

Footnotes to Chapter I

[1](1) Henry L. Abbot, "The Corps of Engineers," in *The Army of the United States, 1789-1896*, Theo F. Rodenbough and William L. Haskins, eds. (New York: Argonaut Press, 1966), pp. 111-125. (2) Irving Crump, *Our Army Engineers* (New York: Dodd, Mead & Co., 1954), pp. 21-77. (3) W. Stull Holt, *Office of Cheif of Engineers of the Army. Its Non-Military History, Activities and Organization* (Baltimore: Johns Hopkins Press, 1923), p. 2.

[2](1) Hammer & Co. Associates, *Economic Report on the Baltimore Region*. Prepared for the Baltimore Regional Planning Council (Washington: Hammer & Co. Associates, 1964), p. 1. (2) Thomas C. J. Whedbee, *The Port of Baltimore in the Making, 1828 to 1878* (Baltimore: F. Bowie Smith & Son, Inc., 1953), p. 3.

[3](1) Pearle Blood, "Factors in the Economic Development of Baltimore, Maryland," *Economic Geography*, XIII (Apr. 1937), p. 187. (2) Baltimore Engr. Dist., *Historical Summary of the Baltimore District Office* (unpublished, Jan. 44). Baltimore Engr. Dist.; Hist. Instal. File, pp. 1-2.

[4]Whedbee, *Port of Baltimore in Making*, pp. 4-5.

[5](1) Whedbee, *Port of Baltimore in Making*, p. 4. (2) Blood, "Factors in Econ. Dev. of Baltimore," *Econ. Geog.*, XIII (Apr. 37), p. 189. (3) For a detailed study of Baltimore during the American Revolution, see Paul Walker, "The Baltimore Community and the American Revolution, 1763-1783: A Study in Urban Development." Ph.D. dissertation, Univ. of N.C., Chapel Hill, 1973.

[6](1) Whedbee, *Port of Baltimore in Making*, pp. 7-8. Blood, "Factors in Econ. Dev. of Baltimore," *Econ. Geog.*, XIII (Apr. 37), p. 189. (3) Francis F. Beirne, *Baltimore—A Picture History: 1859-1958* (New York: Hastings House, 1957), p. 5. (4) For an extensive study of the economic development of Baltimore after the adoption of the Constitution, see Gary L. Browne, "Baltimore in the Nation, 1789-1861: A Social Economy in Industrial Revolution." Ph.D. dissertation, Wayne St. Univ., 1973.

[7](1) James E. Hancock, *Fort McHenry* (Baltimore: Maryland Trust Co., n.d.), p. 4. (2) W. Richard Walsh, "The Star Fort, September 1814," in *Historical and Archeological Project for Fort McHenry*, 1958. Unpublished MS in Ft. McHenry Library, pp. 2-3. (3) S. Sydney Bradford, "The Outworks of Fort McHenry, September 12-14, 1814, in *Hist. and Arch. Proj. for Ft. McHenry*, pp. 5, 11.

[8]Secretary of War Knox also charged Major Rivardi with constructing defenses at Alexandria and Norfolk, in Virginia. Ltr., Knox to Rivardi, 28 Mar., 1794. Part of Rpt., Knox to H.R., 3rd Cong., 2nd sess., 19 Dec., 1794. *American State Papers; Military Affairs*, vol. I, doc. 22, p. 87.

[9]Ltr., Knox to Rivardi, 28 Mar. 1794, p. 87.

[10]Ltr., Knox to Rivardi, 28 Mar. 1794, pp. 87-88.

[11]Ltr., Rivardi to Knox, 13 Apr. 1794. Part of Rpt., Knox to H.R., 3rd Cong., 2nd sess., 19 Dec., 1794. *Amer. St. Papers; Mil. Aff.*, vol. I, doc. 22, p. 88.

[12]Ltr., Rivardi to Knox, 13 Apr. 1794, p. 89.

[13]Ltr., Rivardi to Knox, 20 Apr. 1794.

[14]Ltr., Rivardi to Knox, 13 Apr. 1794. Dodge's military rank apparently was in the Maryland militia, for U.S. Army directories do not mention him.

[15]Ltrs., Dodge to Knox, 8 and 10 July and 14 Sep. 1794. Pt. of Rpt., Knox to H.R., 3rd Cong., 2nd sess., 19 Dec. 1794. *Amer. St. Papers; Mil. Aff.*, vol. I, doc. 22, p. 92.

[16](1) Lee H. Nelson, *An Architectural Study of Fort McHenry* (Dept. of Interior, Nat. Park Serv., Jan. 61), p. 18. (2) Rpt. on State of Fortifications in U.S. from Sec. War Timothy Pickering to U.S. Senate, 4th Cong., 1st sess., 18 Jan. 1796. *Amer. St. Papers; Mil. Aff.*, vol. I, doc. 26, p. 111.

[17](1) Nelson, *Arch. Study of Ft. McHenry*, pp. 21-23. (2) Erwin H. Thompson and Robert D. Newcomb, "Historic Structure Report, Fort McHenry" (Denver Serv. Ctr., Hist. Preservation Team, Dept. of Interior, Nat. Park Serv., May 1974). MS in Ft. McHenry Lib., pp. 12-13. (3) Tousard was a member of the Corps of Artillerists and Engineers. Foncin was not; rather he was one of the engineers the War Department hired temporarily for harbor work.

[18]On 20 July 1795, Alexander Furnival ceded about seven acres to the U.S. William Goodman conveyed slightly more than thirteen acres in 1798 and 1800, and William O'Donnell five acres on 4 January, 1804. Between 10 September, 1836 and 16 November 1838, six additional land acquisitions transferred another twenty-six acres to the fort. Hancock, *Ft. McHenry*, pp. 5-6.

[19](1) Nelson, *Arch Study of Ft. McHenry*, p. 23. (2) Walsh, "Star Fort," *Hist. & Arch. Proj. for Ft. McHenry*, p. 6.

[20](1) Ltr., Pickering to Chmn., H.R., Comm. on Fortifications, 4th Cong., 1st sess., 9 May 1796. *Amer. St. Papers; Mil. Aff.*, vol. I, doc. 28, pp. 115-116. (2) Rpt. on Fortifications by Sec. War Henry Dearborn, 9th Cong., 1st sess., 13 Feb. 1806. *Amer. St. Papers; Mil. Aff.*, doc. 60, p. 194. (3) Thompson and Newcomb, "Hist. Structure Rpt., Ft. McHenry," p. 13.

[21]Rpt. on Fortifications by Sec. War William Eustis, 11th Cong., 2nd sess., 18 Dec. 1809. *Amer. St. Papers; Mil. Aff.*, vol. I, doc. 89, pp. 245-247.

[22]Ltr., Knox to John Vermonnet, 12 May 1794. Pt. of Rpt., Knox to H.R., 3rd Cong., 2nd sess., 19 Dec. 1794. *Amer. St. Papers; Mil. Aff.*, vol. I, doc. 22, p. 93.

[23]Ltr., Vermonnet to Knox, 12 Aug. 1794, p. 94.

[24]Rpt. on State of Fortifications in U.S. from Sec. War Timothy Pickering, 18 Jan. 1796, p.111.

[25]Rpt. on Fortifications by Sec. War Henry Dearborn, 13 Feb. 1806, p. 194.

[26](1) The federal government spent $13,119 in building Fort Madison in 1809. Rpt. on Fortifications by Sec. War William Eustis, 18 Dec. 1809, p. 246. (2) Rpts. on Fortifications by Capt. George Bomford, 30 Jun., 31 Jul. and 1 Sep. 1808, and 1 Dec. 1809. CE, Buell Coll., Nat. Archives, Rec. Gp. 77, docs. 178 and 231, reel 1.

[27]*Ibid.*

[28](1) For the best discussion of the Embargo of 1807, see Louis M. Sears, *Jefferson and the Embargo* (Durham: Duke Univ. Press, 1927). (2) On causes of the War of 1812, see Bradford Perkins, *Prologue to War, 1802-1812* (Berkeley: Univ. of Calif. Press, 1961) and Patrick C. T. White, *Nation on Trial: America and the War of 1812* (New York: John Wiley & Sons, 1965). Both stress maritime factors. (3) Julius W. Pratt, *Expansionists of 1812* (New York: Macmillan & Co., 1949), sees the war resulting from a desire to expand into Canada and Florida.

[29]Franklin E. Mullaly, "The Battle of Baltimore," *Maryland Historical Magazine*, LIV (Mar., 1959), 61-65.

[30]Ltr., Sec. War John Armstrong to Col. Joseph G. Swift, 31 Mar. 1813. Buell Coll., Rec. Gp. 77, doc. 405, reel 2.

[31]Draft of instr., Swift to Capt. Samuel Babcock, 26 Apr. 1813. Buell Coll., Rec. Gp. 77, doc. 417, reel 2.

[32]Babcock, Rpt. on Ft. McHenry, 1 Dec. 1813. Buell Coll., Rec. Gp. 77, doc. 451, reel 2.

[33]*Ibid.*

[34]Gilbert Byron, *The War of 1812 on the Chesapeake Bay* (Baltimore: Maryland Historical Society, 1964), pp. 24-31.

[35](1) John K. Mahon, *The War of 1812* (Gainesville: Univ. of Fla. Press, 1972), p. 307. (2) Walter Lord, *The Dawn's Early Light* (New York: W.W. Norton & Co., 1972), pp. 233-235.

[36](1) Mahon, *War of 1812*, p. 308, (2) Lord, *Dawn's Early Light*, pp. 238, 247-249. (3) Mullaly, "Battle of Baltimore," *Md. Hist. Mag.*,LIV (Mar 1959), 65-67. (3) Frank Cassell, *Merchant Congressman in the Young Republic: Samuel Smith of Maryland, 1752-1839* (Madison: Univ. of Wis. Press, 1971), pp. 177-197. (4) John S. Pancake, *Samuel Smith and the Politics of Business, 1752-1839* (University: Univ. of Ala. Press, 1972).

[37]For detailed accounts of the Battle of Baltimore, see (1) Byron, *The War of 1812 on the Chesapeake Bay*, pp. 204-207. (2) Harry L. Coles, *The War of 1812* (Chicago: Univ. of Chicago Press, 1965), pp. 182-185. (3) Reginald Horsman, *The War of 1812* (New York; Alfred A. Knopf, Inc., 1969), pp. 204-207. (4) Lord, *Dawn's Early Light*, pp. 252-294. (5) Mahon, *War of 1812*, pp. 308-312. (6) Mullaly, "Battle of Baltimore," *Md. Hist. Mag.*, LIV (Mar. 1959), 82-103. (7) Cassell, *Merchant Congressman*, pp. 198-209.

[38]Ltr., Baltimore Comm. of Vigilance & Safety to U.S. Senate, 26 Jan. 1815, 13th Cong., 1st sess. *Amer. St. Papers; Mil. Aff.*, vol. I, doc. 139, pp. 602-603.

[39]Ltr., WD to Walker K. Armistead, 8 Sep. 1815, Buell Coll., Rec. Gp. 77, doc. 587, reel 2.

[40]Ltr., Walker K. Armistead to Brig. Gen. Joseph C. Swift, 10 May 1815. Buell Coll., Rec. Gp. 77, doc. 556, reel 2.

[41](1) Ltr., Swift to Sec. War, 15 Nov. 1816. Doc. 694, reel 3. (2) Ltr., Swift to Walker K. Armistead, 15 Nov. 1816. Doc. 696, reel 3. (4) Ltr., Swift to Sec. War, 4 Dec. 1816. Doc. 698, reel 3. (5) Walker K. Armistead, Rpt. on Fortifications, 30 Nov. 1918. Doc. 834, reel 3. (6) Thompson and Newcomb, "Historic Structure Rpt., Ft. McHenry," pp. 24-25. All in Buell Coll., Rec. Gp. 77.

[42]Emanuel R. Lewis, *Seacoast Fortifications of the United States* (Washington: Smithsonian Institution Press, 1970), p. 24.

Chapter II
Building A Nation: The Baltimore Engineers and Early Internal Improvements

Throughout the War of 1812 the Corps of Engineers in the Baltimore region devoted itself to coastal defenses. The scarcity of skilled professional engineers, however, soon pushed Corps personnel into assisting private and public efforts to develop the nation's transportation system. The Military Academy was the nation's only engineering school, so, most early engineering expertise resided with the Corps. These skills were needed for developing internal improvements; hence, the beginning of the Army engineer's aid in civil works. In the Maryland area, the assistance of Army engineers in constructing communications networks had tremendous influence on the economic development of the state.

The lack of decent roads had hurt the defense effort during the War of 1812. In March of 1813, congressional concern caused the creation of a Corps of Topographical Engineers to survey, map and gather topographical data on coastal and inland frontiers. Disbanded after the war, it was revived in 1816 and two years later it became part of the Engineer Department. As such, the Topographical Bureau found itself heavily engaged in internal improvements, with officers being detailed to aid in surveys by private transportation companies and promoters. Its functions often overlapped those of the regular Corps. On 5 July 1838, the Topographical Bureau became a separate branch of the army, the Corps Topographical Engineers. It directed river-and-harbor work and later it divided that responsibility with the regular Army Engineer Corps. The Topographical Bureau was abolished in 1863.[1]

The debate over how extensively the federal government should promote internal improvements raged from the inception of the republic. Did the constitution authorize the federal government to spend money on internal improvements within the states? How much collaboration should exist between private and government development? These questions were continually argued. When Thomas Jefferson became President in 1801 there was substantial clamor for direct government appropriations for internal improvements. Although Jefferson philosophically leaned toward a do-nothing government, he did favor development and exploration of the West. His proposal for a constitutional amendment that would explicitly allow government expenditures in time of peace for rivers, canals and roads met enough opposition to prevent adoption. Nevertheless, Congress in 1806 did authorize the building of the Cumberland or National Road, provided the states through which the road was to pass consented.[2]

To Thomas Jefferson's Secretary of the Treasury, Albert Gallatin, a massive government program for internal improvements was mandatory. On 6 April 1808, in response to a Senate resolution, he issued his famous *Report on Roads and Canals* that called for a ten-

Albert Gallatin, Secretary of the Treasury under Presidents Thomas Jefferson and James Madison. U.S. Signal Corps—Brady Collection.—National Archives

year plan of government construction. Specifically, he proposed to tie the country together, north to south and east to west, through a series of canals, river improvements and turnpikes. He realized that engineering surveys by the government were needed to properly plan national internal improvements. Private and state sources lacked the necessary technical manpower. Good roads and canals would strengthen the union.[3] "The inconveniences, complaints, and perhaps dangers, which may result from a vast extent of territory," Gallatin importuned, "can not otherwise be radically removed or prevented than by opening speedy and easy communications through all its parts."[4]

The War of 1812 postponed the adoption of any national internal improvement program, but in 1816 a renewed resolve to develop the nation's transportation system manifested itself. In that year, Congress enacted a tariff designed to protect domestic production as well as to collect revenue, and chartered the Second Bank of the United States. Led by South Carolina nationalist John C. Calhoun, Congress next approved a bill to distribute among the states, for local internal improvements, the $1.5 million bonus the Bank of the United States paid for its charter. President James Madison, denying that the appropriation fell within the enumerated powers of the federal government, vetoed this so-called Bonus Bill.[5]

While the veto stalled a national phase of internal improvements, Calhoun continued to advocate strong federal action to construct transportation facilities. As Secretary of War, in 1818 he wrote his own *Report on Roads and Canals*, using Gallatin's study as a guide. Not only would a good transportation network benefit commerce; it was indispensable militarily. "The road or canal can scarcely be designated," he wrote, "which is highly useful for military operations, that is not equally required for the industry or political prosperity of the community."[6] He proposed employing the army, and particularly its engineers, in constructing the roads and canals. To survey the various routes "the army can furnish able military and topographical engineers." Calhoun concluded: "The propriety of employing the army on works of public utility cannot be doubted. Labor adds to its usefulness and health."[7]

II

Meanwhile, construction of the Cumberland Road began with the letting of the first contracts in 1811. Cumberland, Maryland is located in the mountains on the Potomac River just a little more than thirty-three miles from the Pennsylvania border. To the east and north runs Will's Creek. Building a road west and east from this primitive outpost promised Cumberland's community the prosperity brought by commerce and trade. The thirty-three miles to Pennsylvania passed through rugged, twisting, climbing and beautiful countryside of wooded slopes.[8]

Until 1824, the Treasury Department supervised the laying of the road. To superintend the project, David Shriver, Jr., a thorough and capable young engineer, established headquarters in Cumberland. The task before him would not be an easy one. Chopping trees, gouging and digging paths around and through mountains, and hauling stone made the assignment agonizing, back-breaking and painfully slow. Each contractor supervised his own work crew with varying degrees of efficiency.

The first four contracts covered a ten-mile section toward Brownsville, Pennsylvania. After about eight months of work four miles were nearly completed. Shriver noted that the leveling, shaping and laying of stone, though haphazard, seemed to be progressing. Already he was concerned about provisions for keeping the road in repair in the future. He recommended that travelers be assessed tolls so that there would always be a repair fund.[9]

Contractors completed the first ten miles by the end of 1812, but forging the next eleven miles did not move as quickly. The uncommonly rainy and wet summer of 1814 hampered the work. Also, contractors reported difficulty in procuring enough laborers.[10] Although Shriver could report in December 1815 that thirty-five miles of the road were usable, he blamed the slow progress to date on the inefficiency of the contract system. An inadequate work force continued to plague contractors who often bid low and then could not afford to pay their workers. Shriver recommended that future work be done by day labor under his supervision.[11] Because of the scarcity of labor his suggestion was never tried until some years later. The government even had difficulty hiring two permanent laborers to repair the road. Since the road went through uninhabited country, Shriver found that no labor could be had at reasonable wages. Getting workers from contractors was impossible. No one could be induced to leave an employer to toil for the government for a month or two unless he was paid extraordinary wages. When he worked for a contractor, a laborer's board was usually provided. While working for the government he would have to board and camp out himself. If human labor proved difficult to acquire, the employment of animal labor was not the answer. "Grain has become so scare and the price so high," Shriver wrote in 1816, "that the contractors are obliged to feed their horses merchant flour, and do not use horse labour, except when it cannot be done without."[12]

For Shriver, road maintenance was imperative, and he constantly repeated this theme in much of his correspondence with the Treasury Department. "I do not think the old saying 'a stitch in time saves nine' was ever more fully bonified," he observed, "than in that of repairing a turnpike road."[13] In 1817 he estimated that contracting out repairs would cost $100 per mile because of the abuse to which the turnpike had been subjected. The dragging of saw logs along the road had in many areas destroyed the upper stone surface. Other abuses included destruction of bridges, culverts and drainage ditches; leaving fallen trees in the middle of the path; and placing fences and houses on the sixty feet of land allotted for the width of the road.[14]

In June 1818, Shriver wrote that *now* was the time for major repairs to the road. He expected heavy traffic during the autumn and next spring of more than 50,000 barrels of flour and other produce and merchandise. Unless repairs were begun before that time, it might prove too late. "The best season for making repairs," he lamented, "is rapidly seeping by."[15] The next spring Shriver warned that "If repairs are not made without loss of time the road between this place (Cumberland) and Union Town, will be destroyed as it was not repaired last summer . . . by the next it will be hardly passable."[16]

III

This disrepair of the Cumberland Road caused another confrontation between Congress and the President that eventually led to a more extensive commitment of the federal government to internal improvements. In 1822 Congress passed a Cumberland Road Repair Bill which authorized the President of the United States to collect tolls on the road and to use the money for repairs. President James Monroe immediately vetoed the legislation. He did not object to Congress appropriating money for internal improvements, but he questioned its authority to erect toll booths and to control the operation of the turnpike. A constitutional amendment was required to transfer the power of jurisdiction

General J.K.F. Mansfield. U.S. Signal Corps–Brady Collection—National Archives

to the national government. Monroe concluded:

> A power to establish turnpikes with gates and tolls, and to enforce the collection of the tolls by penalties, implies a power to adopt and execute a complete system of internal improvement . . . I am of the opinion, that Congress does not possess this power; that the states, individually, cannot grant it; for, although they may assent to the appropriation of money within their limits for such purposes, they can grant no power of jurisdication or sovereignty, by special compacts, with the United States. This power can be granted only by an amendment to the constitution.[17]

Despite his veto, Monroe's acknowledgment of Congressional authority to appropriate money for internal improvements placed the federal government in the center of developing the nation's early transportation system. In 1823 he signed a bill for repairing the Cumberland Road which made no mention of tolls. And in 1824 the government adopted legislation which instituted national planning of internal improvements. The General Survey Act of 1824 empowered the President to commission surveys, plans and estimates of roads and canals he judged to be of national importance. In passing the Survey Act, Congress conformed to the view of Chief Justice John Marshall, in *Gibbons v. Ogden* (1824) that the federal government had overriding power over commerce and interstate highways of transportation. The Act gave the Corps of Engineers a crucial role in internal improvements by authorizing the President to carry out surveys by employing "two or more skillful civil engineers, and such officers of the corps of engineers . . . as he may think proper."[18]

Monroe created a Board of Engineers for Internal Improvements to administer the Act. Although it lasted until only 1831, during its brief life, the Board provided engineering aid to a wide range of projects. The General Survey Act itself remained in effect until 1838, when the enthusiasm for federal leadership in internal improvements began to wane. A combination of the financial panic of 1837, sectional rivalry, and the doctrine of states' rights caused the Act's repeal. Also, during 1838 Congress enacted a law forbidding the army to detail any member of the Topographical Engineers to work for a private company.[19]

Although President Andrew Jackson opposed the alliance between government and private business, and fought against federal appropriations for internal improvements because of the possibilities of corruption and waste, the record shows that many projects continued to receive aid during his administrations.[20]

It was only after the Civil War, with the emergence of the Republican Party, that widespread encouragement of national, state and private enterprises again prevailed. Nevertheless, between 1824 and 1838, the Army Corps of Engineers applied their skills to the difficult task of connecting the Atlantic coast and the West. During this period the Army Engineers in what is now the Baltimore District area played dominant roles in

repairing the Cumberland Road and surveying the Chesapeake and Delaware and Chesapeake and Ohio Canals and the Baltimore and Ohio and Baltimore and Susquehanna Railroads.

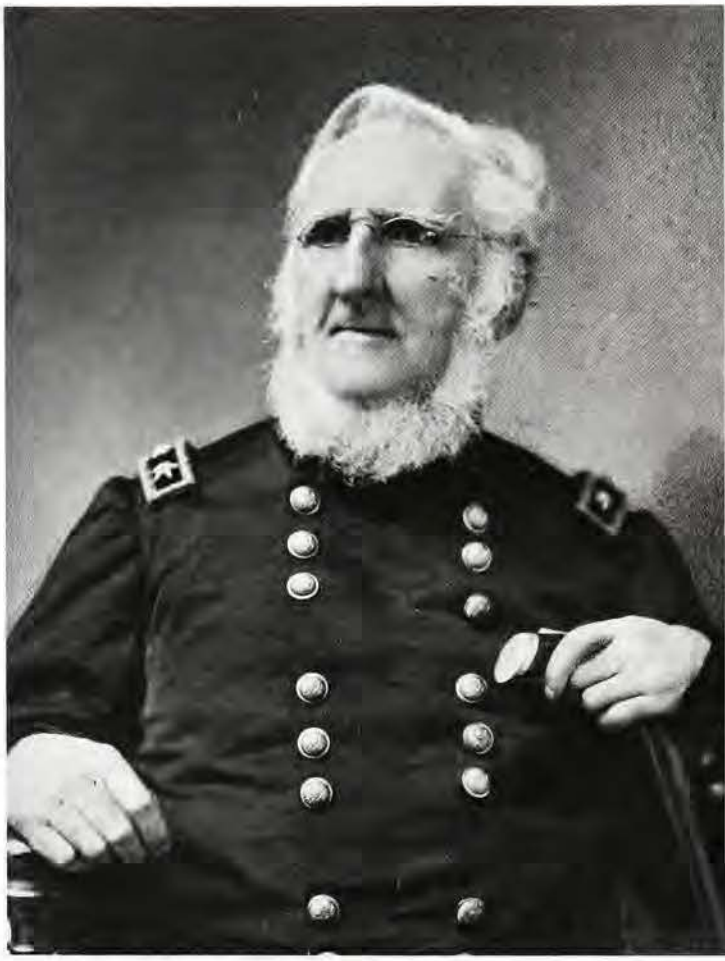
IV

By the time of the passage of the General Survey Act of 1824 the National Road east of the Ohio River required extensive renovation. The section in Maryland, in particular, needed fixing. David Shriver reluctantly supervised repairs during 1823-24, but as he himself noted, "The road has suffered so much, that its original form is lost, and the sum in hand is not sufficient to stop the progress of ruin on it."[21] After 1824, the War Department took over supervision of the road.

Nothing was done to prevent further deterioration of the highway until 1827, when Congress appropriated $30,000 for restoration. This sum was wholly inadequate and allowed the Engineering Department to do little more than examine the extent of the damage of the previous couple of decades.[22] In his Annual Report for 1831, Secretary of War Lewis Cass of Michigan observed that unless the road from Cumberland to the Ohio River were repaired immediately, "that expensive and useful work will be ruined. Many parts of it are now so seriously injured as to render travelling difficult, and sometimes dangerous."[23]

Brevet Brig. Gen. Charles Gratiot, Chief of Engineers, temporarily assigned First Lt. Joseph K. F. Mansfield to oversee repairs of the turnpike east of the Ohio River. Mansfield would later gain distinction as an army engineer during the Mexican War. (As a major general during the Civil War he would be killed at the Battle of Antietam in 1862.) In a letter dated 23 July 1832, Gratiot instructed Mansfield to examine, make estimates and let contracts for overhauling the road, beginning with the worst sections. All repairs were to be done by using the so-called McAdam system named for its Scottish inventor.

First, all the pavement of the old road had to be broken up and the stones laid and embedded in the surface removed. Next, the road bed was to be raked smooth. Ditches along the side of the highway were to be dug so that water could not stand higher than eighteen inches below the lowest part of the surface. After cleaning the culverts, surfacing could begin. Only limestone, flint or granite, crushed to a size not larger than four ounces, was to be used for covering the turnpike. When the roadbed was well compacted this crushed-stone mixture was to be spread about three inches thick. Then travel would be permitted for a short period and another three inches laid. For especially rough sections, Gratiot suggested that the covering total nine inches.[24]



General Richard Delafield. U.S. Signal Corps–Brady Collection—National Archives

The plan had flaws, not the least of which were time and expense. No good stone could be found in the roadbed that could be crushed and used for the surface. Soft sandstone predominated but, when crushed, it washed away during the first heavy rain. The only

suitable material in the area—limestone—had to be hauled from valleys and creek beds far from the road. Gratiot noted that the expense of mending the road with limestone was "far greater than anticipated."[25]

Lt. Mansfield was shocked by what he discovered at Cumberland during the summer of 1832. The turnpike was in horrible condition, he wrote, much to his dismay, and "every rod of it will require great repair. Some of it is impassable."[26]

Capt. Richard Delafield, who had entered the Military Academy at the age of sixteen, succeeded Mansfield in October and was equally as pessimistic.[27] Besides the deplorable state of the road, Delafield complained of headstrong contractors who removed the old road bed without proper preparation for drainage, and of incompetent superintendents who neglected to prevent such errors. Delafield suspended making future contracts until he could properly instruct the superintendents in their duties.[28]

During the spring of 1833, Delafield directed First Lt. John Pickell (USMA 1822), who was assigned to construct a section of the road between Cumberland and Frostburg, Maryland under the McAdam plan, to abandon the contract system if he felt day labor or task work would be more efficient. The letter, also sent to other foremen, noted disparagingly that the "system of doing the work by contract, has been found most pernicious, productive of but little good, with great expenditure."[29] After an inspection during May, Delafield happily wrote that the "abandonment of the contract system and introduction of the job, or task plan, bids fair to realize my most sanguine expectations."[30]

Also during May, Delafield recommended an important modification in the mending process itself. Delafield expressed the opinion that, in order to save money, all the old pavement not be broken up as required by the Department's instructions of July 1832, but that where it was in good condition it be retained and the crushed stone placed over it.[31] Gratiot immediately rescinded the directive that the old bed be removed in all places and left the matter to Delafield's discretion.[32]

When Gratiot inspected the state of repairs in June 1833 he still was not pleased with what he saw. He found that too much sand and other perishable stone had been placed on the road and that not enough attention had been paid to keeping the side drains open in order to prevent water from causing rapid destruction through erosion. He warned Delafield that while economy was important, "you should constantly bear in mind that the wishes of the government are to have a superior road, both as regards workmanship, and the quality of materials used in its construction."[33]

Work continued during 1833 with day labor covering 3,237 rods of the highway in Maryland with the crushed stone. Many more rods also were prepared for covering.[34] Apparently Delafield and the Engineer Department were not completely satisfied with the day-labor system, however, because on 29 May, 1834, the captain ordered all his section officers to have the "work done by contract instead of job work and day labour as was practised last year."[35] He cautioned his officers to be wary of several frauds contractors had practiced in the past: diminishing the size and altering the angle of the grade; breaking stone of softer and inferior quality than the sample agreed upon; breaking the stone into larger lumps than specified; delivering less than a full load of limestone after a full load had been paid for. In addition, Delafield again drastically altered the previous construction system by directing his superintendents to preserve the old bed in all places, never breaking it up, but instead smoothing it with sledgehammers if necessary to prepare it for the crushed-rock cover.[36] Breaking up the old pavement had proved too inefficient and costly; in short, not worth the effort.

At the same time, a dispute arose with the state of Maryland over the nature of a bridge the engineers planned to erect over Will's Creek. The original path of the road went over Will's Hill just outside Cumberland, a rise of 800 feet in four and a quarter miles. The engineers proposed to change the course of the road with a new route around the hill and over the creek. The state of Maryland agreed to the alteration. It was provided that the bridge would be constructed in stone. During the summer of 1834, however, Delafield requested permission to construct the bridge with stone abutments and wingwalls, and wooden superstructures. A stone bridge, he claimed, would cost $15,000, a wooden span $7,000.[37] The Engineer and War Departments approved the change to wood,

but the governor of Maryland protested.[38] Finally, after several months of squabbling, it was agreed after all to construct the traverse over Will's Creek in stone. It was completed in the fall of 1836 at a total cost of around $27,000. The bridge was 291 feet long, more than 26 feet above the water, and had two elliptical arches. Delafield described it as "a work of great durability, most excellent material, and skillfully put together."[39]

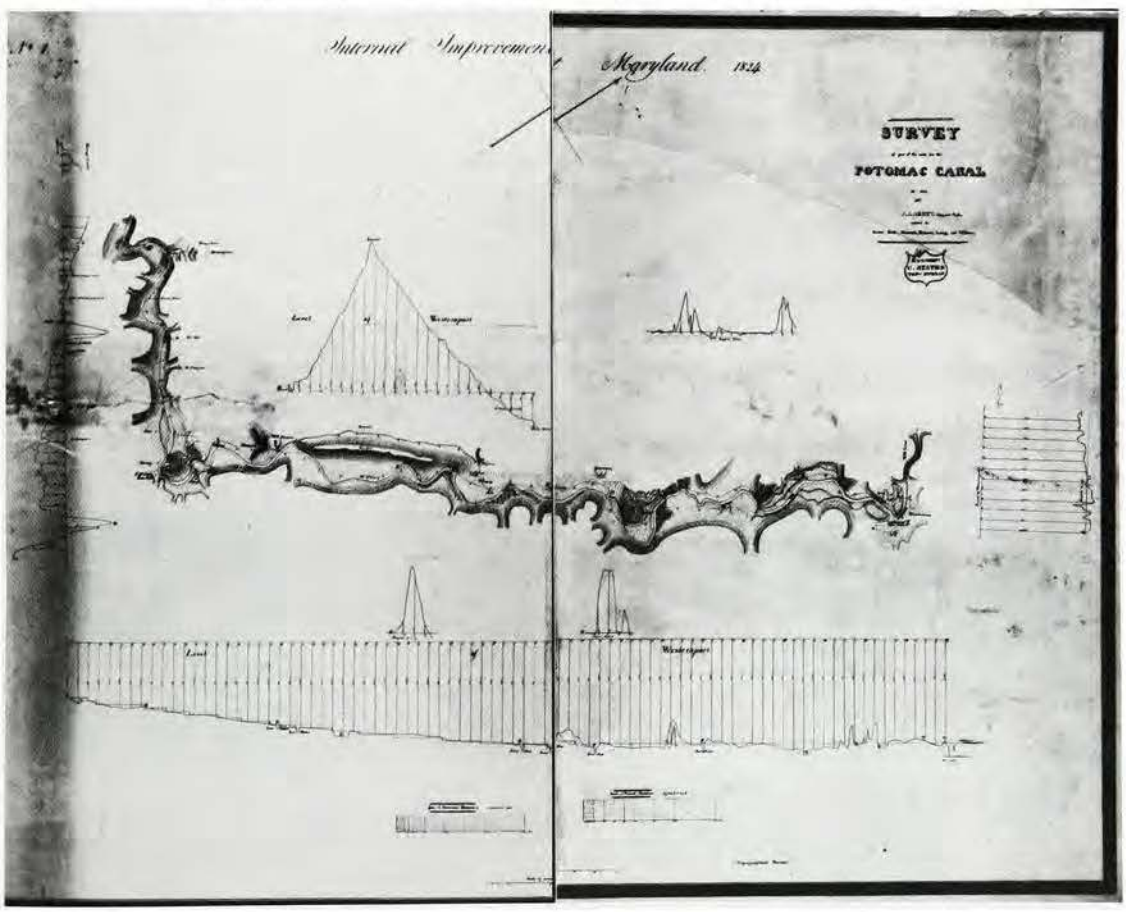
By the end of 1835, except for a few bridges, the Engineers had finished the repairs on the turnpike itself east of the Ohio River. From 1832 through 1835 the government spent more than $900,000 on this restoration. The original cost of building this portion of the road had been about double that sum.[40] The states through which the highway passed became responsible for its management, including collecting tolls to provide funds to keep it properly repaired. After they had concluded their assignments, Secretary Cass commended Capt. Richard Delafield and the officers under him who had worked on the road for their "zeal and professional ability."[41]

While building the Cumberland Road through rugged mountainous country—a tremendous engineering feat—connected the Atlantic coast with the Midwest, the journey across the mountains still remained painfully slow. It took about one month under ideal conditions for a freight wagon to travel from Baltimore to central Ohio. Further internal improvements were still needed to make the connection between east and west less laborious. During the early 1820's canals seemed to be the panacea.[42]

V

During the first year after the passage of the General Survey Act of 1824, canal

Major J.J. Abert of the Topographical Engineers made this map of the proposed Chesapeake and Delaware Canal.—National Archives.



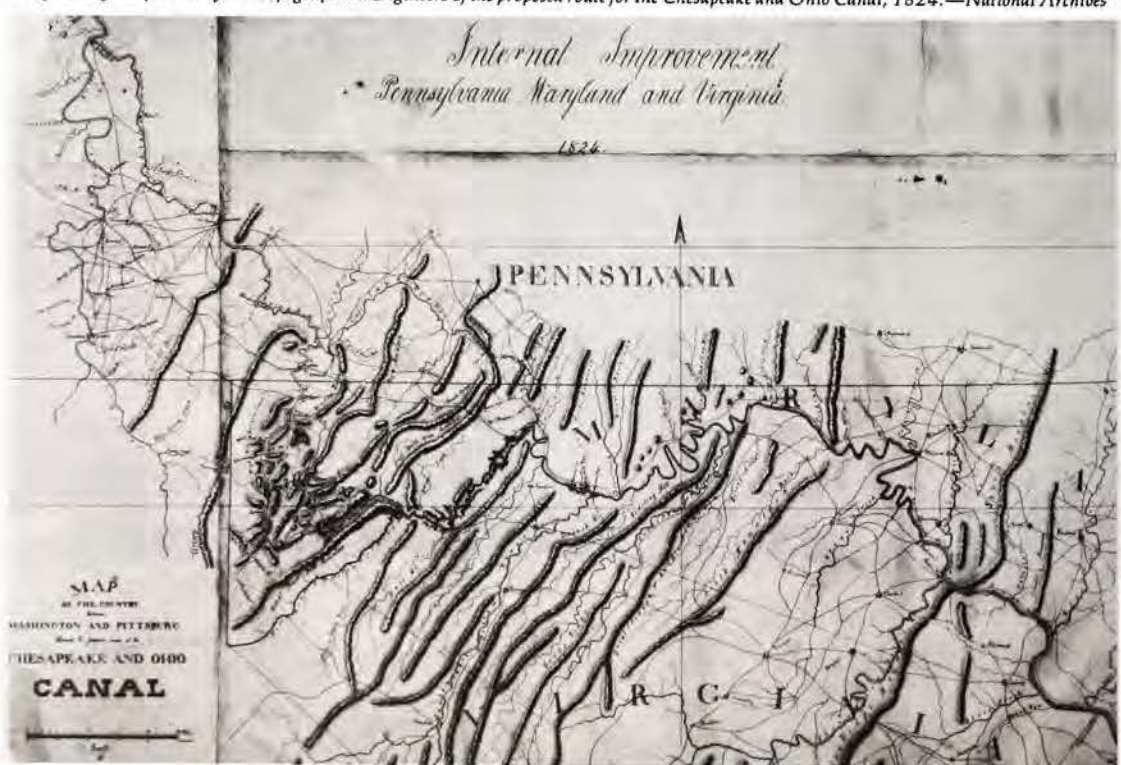
surveys dominated the Army Engineers activities in civil works. Maryland received engineering aid for canals even before passage of the Act when, in 1823, Army Engineers made a topographical survey of a proposed canal between Baltimore and Conowingo on the Susquehanna River in Pennsylvania.[43] Also, topographical engineers examined in Maryland the Patuxent River, the St. Mary's River and harbor, and the Patapsco River at Hawkins Point near Baltimore.[44]

Baltimore, in a battle with Philadelphia for the trade from Pennsylvania's Susquehanna Valley, hoped that by canalizing the Susquehanna River she could tap a rich source of commerce. But in the 1820's, during the canal craze, the city was unable to finance the project.[45] At the same time, however, the Army Engineers helped construct the Chesapeake and Delaware Canal which provided Philadelphia access to Chesapeake Bay and materially enhanced that city's position as a trade center. In 1823 Brig. Gen. Simon Bernard and Lt. Col. Joseph G. Totten surveyed proposed routes for promoters of the canal. They finally decided on a course more than thirteen miles long from Delaware City, Delaware, forty miles south of Philadelphia, to Chesapeake City, Maryland. Between 1824 and 1829, up to 2,600 laborers dug the canal at a cost of over $2 million. Construction difficulties encountered included having to excavate through marshy mud lands near the Delaware River and through solid rock eighty to ninety feet deep at the canal's midpoint. The canal opened in October 1829.[46]

Meanwhile, to the south of Baltimore, work commenced on the Chesapeake and Ohio Canal, with Army Engineers again having an important part in the surveying. This canal also threatened Baltimore's trade by tying the Cumberland Valley to Washington, D.C. In 1824, two topographical brigades and one party of civilian engineers explored more than 260 miles of possible routes for the canal. These surveys included studies of routes to connect the canal to Baltimore and Annapolis. In a preliminary statement the Board of Engineers displayed extreme optimism in regard to the enterprise's practicality and value.[47] Its final report, however, while continuing to uphold the venture's feasibility, estimated that the cost of the canal would be around $22 million instead of the $4 or $5 million canal supporters had planned on. Not knowing that the coming of railroads would make canals obsolete before they were constructed, the Board concluded that "the Chesapeake and Ohio Canal, not withstanding the great first cost which it will require may, with full and entire confidence, be considered as not expensive, in relation to the immense advantages, of every kind, which it offers."[48]

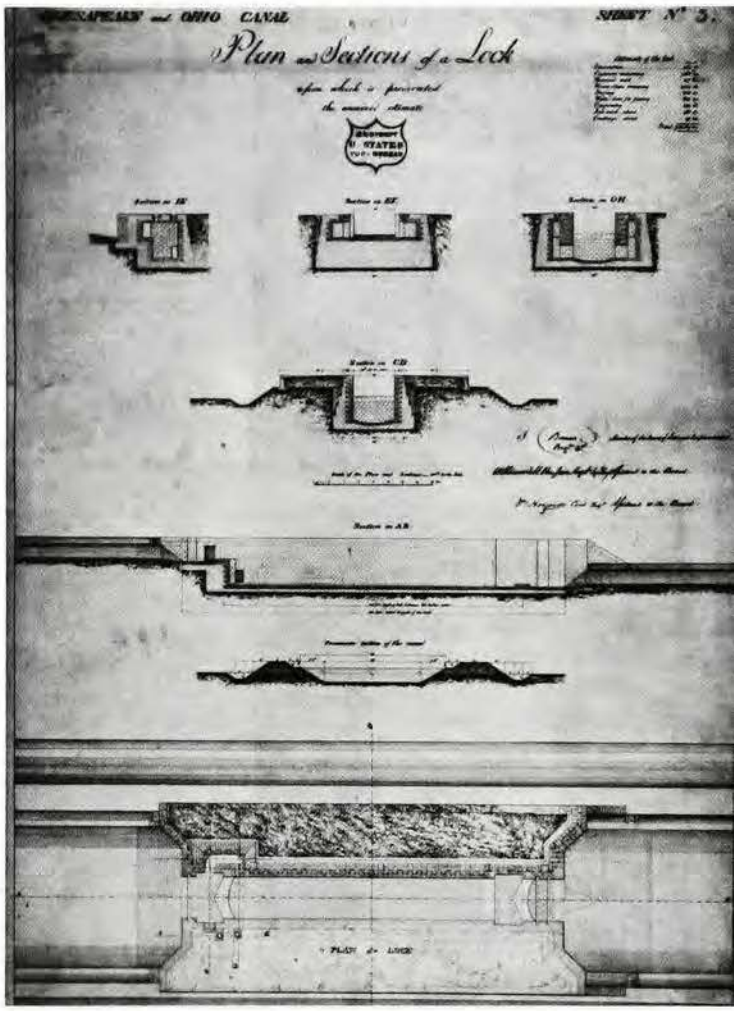
Nevertheless, the report cast gloom on the

Early Survey Map made by the Topographical Engineers of the proposed route for the Chesapeake and Ohio Canal, 1824.—National Archives



canal's prospects. Such a staggering sum as $22 million could not be raised. Canal boosters organized to discredit the Engineers report and urged that a new investigation be initiated. Critics of the Engineer Board alleged that in its estimates the Board had allowed too much for costs of masonry, walling, excavation, and labor. In order to reconcile the differences between the Engineer Board and its critics, two civil Engineers, James Geddes and Nathan Roberts, made a survey in 1827 and calculated that the cost of constructing the canal as far as Cumberland would be around $4.5 million.[49]

Reassured by this estimate, in June 1828, promoters organized the Chesapeake and Ohio Canal Company. One month later, on 4 July, President John Quincy Adams crowned the elaborate ground-breaking ceremonies by turning the first spadeful of earth near Little Falls on the Potomac. But by the time construction began the canal era had passed its peak and was on the decline. Labor trouble, a cholera epidemic and lack of funds plagued construction throughout the early years. When the canal finally reached Cumberland, in 1850, the original plan of extending it to Pittsburgh was dropped. It had already cost $11 million—or $60,000 per mile.[50]



Topographical Bureau Drawing of a proposed plan for a lock on the Chesapeake and Ohio Canal, n.d.—National Archives

This 1825 map shows the Wills Creek Section of the proposed Chesapeake and Delaware Canal near Cumberland, Maryland—National Archives

Colonel Stephen H. Long. U.S. Signal Corps–Brady Collection—National Archives

VI

Meanwhile, the city of Baltimore, facing competition from Philadelphia and the Chesapeake and Delaware Canal to the north, and from Washington and the Chesapeake and Ohio Canal to the south, boldly moved to thwart these challenges by inaugurating a plan to build a railroad across the mountains to Ohio. Born of desperation, this courageous support of relatively new and untried technology proved to be a far-sighted approach. Again the Army Corps of Engineers played an important role by providing invaluable aid to the Baltimore and Ohio Railroad Company.

The Baltimore and Ohio Railroad Company, incorporated in February 1827, was the first railroad to ask for and receive engineering assistance from the Army.[51] Because of the scarcity of civilian engineers, government engineering aid was mandatory for success. Secretary of War James Barbour justified loaning government engineers to the Baltimore and Ohio Railroad by observing that, "Although the railroad is proposed to be effected by individual enterprise alone, it is certainly of great national importance, and justified the department in applying its means to ascertain its practicability."[52]

During 1827 and 1828, the government sent three engineering parties to execute preliminary surveys for the Baltimore and Ohio Railroad. Brevet Maj. Stephen H. Long and Brevet Capt. William G. McNeill, both of the Topographical Bureau, headed two of the teams while Dr. William Howard, a civil engineer employed by the Engineer Department, led the third. Long, who later would gain fame as an explorer of the West, and McNeill, who continued to work on railroads for the rest of his career, joined civilian engineer Jonathan Knight on the company's board of engineers. Knight had previously surveyed parts of the Cumberland Road.[53]

The results of the initial reconnaissance by the Army Engineers which compared the routes west across Maryland confirmed the practicability of the bold project. The Engineers concluded that the best route for the track would be through the valley of the Patapsco River and then in the direction of Bennett's Bush or Linganore Creek to Point of the Rocks, where the Potomac River passed Catoctin Mountain. The company enthusiastically accepted the Engineers recommendations; construction would begin at once.[54]

On 4 July, 1828, the same day that President John Quincy Adams helped break ground for the Chesapeake and Ohio Canal, a more significant ceremony took place in Baltimore. There, amid a lively crowd of spectators, ninety-year-old Charles Carroll of Carrollton, one of the signers of the Declaration of Independence, laid the cornerstone of the Baltimore and Ohio Railroad. Three days later, Army Engineers began surveying for a definitive route for the road.[55]

During 1828 officers of the Topographical Engineers explored and surveyed the entire route of the road from Baltimore to the Ohio River. The company, recognizing its indebtedness to the government for this indispensable scientific assistance, constantly praised the Engineers for the outstanding service

Ground breaking ceremony for the Baltimore and Ohio Railroad, July 4, 1828.—Library of Congress.

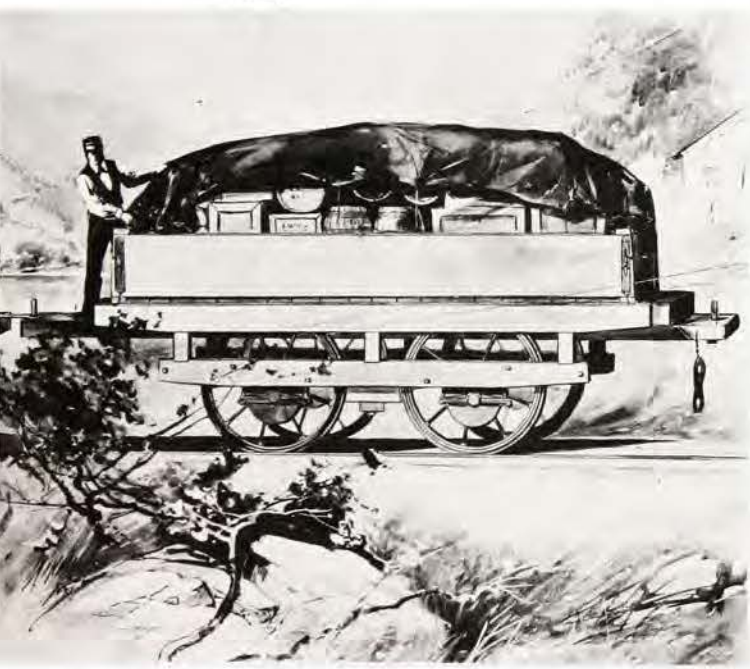
they were performing.[56] The U.S. Senate Committee on Roads and Canals, in an optimistic report on the railroad's future, also lauded the Engineers thoroughness. "Scientific officers, of the Topographical Engineers, have minutely examined the country through which it is expected this road will be located," the committee informed the Congress, "and the most satisfactory assurances of its practicability, and of great facilities for its construction, are given."[57]

While the Army Engineers continued their reconnaissance tasks, the company sent Capt. McNeill, Second Lt. George W. Whistler and Jonathan Knight to England to study British railroad technology. They examined the construction and locomotive power of the two British railroads then in operation. After their return, the laying of the track began in October 1829 with Whistler in charge. Thus, not only did Army Engineers conduct extensive surveys for the railroad, but they were also responsible for the laying of the first track for passenger cars in the United States. In May 1830, the first thirteen miles of track, from Baltimore to Ellicott's Mills (now Ellicott City), opened for passenger service.[58]

The Army Engineers association with the Baltimore and Ohio Railroad terminated abruptly. After the opening of this thirteen-mile section of track, a dispute arose between the company's board of engineers and a civilian superintendent of construction, Caspar W. Wever, who had previously worked on the Cumberland Road. McNeill charged Wever with contract violations, being insub-

One of the Baltimore and Ohio Railroad's first locomotives, the "Atlantic," 1832.—Library of Congress

Baltimore and Ohio Railroad freight car, 1832.—Library of Congress



ordinate to the board of engineers, and of falsifying contract prices. McNeill brought the charges alone, with the other two members of the board, Long and Knight, disqualifying themselves. Long said he was prejudiced against Wever even before the alleged violations; Knight, on the other hand, termed Wever a very close friend. McNeill argued his case before the railroad's board of directors. Unfortunately, no written records were kept of the proceedings, so there is no explicit account of the charges nor of the evidence presented. In the end, the company's directors sided with Wever and dissolved the board of engineers. By June 1830, the Engineer Department in Washington had reassigned all Army Engineers working with the Baltimore and Ohio Railroad. But the Engineers had already surveyed the road to Ohio and had constructed its first section. Their services were no longer essential.[59]

The Baltimore and Ohio Railroad continued to prosper and expand through the next decades. A controversy with the Chesapeake and Ohio Canal Company over land at Point of Rocks slowed progress temporarily, but a compromise in 1832 allowed both companies to proceed with construction. By 1834, track had reached Harper's Ferry in what is now West Virginia, and in 1835 the company opened a branch line to Washington, D.C. The track stretched to Cumberland by 1842, eight years before the Chesapeake and Ohio Canal, and crossed into Wheeling, West Virginia in 1853.[60] In the western part of Maryland alone, the economic influence of the railroad was tremendous in stimulating trade and expanding industry and agriculture. The tonnage volume of products such as flour, tobacco and coal reaching Baltimore more than tripled from 1832 to 1852.[61]

VII

Army Engineers in the Baltimore area also played an important part in developing another railroad, the Baltimore and Susquehanna. In 1830, after withdrawing Army Engineers from the Baltimore and Ohio, Chief of Engineers Charles Gratiot assigned Captain McNeill and Lieutenant Whistler to assist this new company in surveying its route. Joseph Gardner Swift, former Chief Engineer of the Corps (1812-1818), worked as a civil engineer for the line. The stockholders

received the Engineers jubilantly and immediately put them to work. By October the company could announce, "that the Engineers have been most diligently and extensively engaged."[62]

After measuring a course for the Baltimore and Susquehanna line the Topographical Bureau supervised construction with McNeill at the helm. He remained with the railroad until 1836, and the track itself reached the Pennsylvania state line in 1838.[63]

VIII

Throughout this entire period from the passage of the General Survey Act in 1824 through 1838 Army Engineers applied their scientific skills toward developing internal improvements on private, local, state and national projects. As has been described, this was particularly true in Maryland. But trained engineers, civil or military, were still too few to meet the needs of the expanding nation.

A recurring complaint from the War Department, the Engineer Corps and the Topographical Bureau was about overworking Army Engineers and the need to train more Engineer officers to fulfill required duties. Civil works now combined with military functions to impose an awesome burden on the Engineer Department. Secretary of War James Barbour succinctly summarized the Engineers dilemma in a letter to Congress in 1826. He observed:

> Should the officers of engineers be employed in surveying the routes for roads and canals, and in improving the navigation of rivers and harbors, and in forming plans and estimates for their execution, and be charged with the superintendence of them, the present number in service will be wholly inadequate to perform the service, in addition to the discharge of their regular duties. I am fully of the opinion the corps of engineers should be enlarged by degrees, by doubling its present number.[64]

Part of the Corps' dilemma resulted from more West Point graduates becoming civil engineers than the number who remained in the service. This, combined with Congressional squabbling over the size of the Corps, forced the War Department to continue its complaint about the lack of skilled engineers under its command. Annually the Department asked for an increase in the number and the pay of the officers of the Corps of Engineers. Brevet Lt. Col. John J. Abert, Chief of the Topgraphical Bureau, importuned Congress for more officers by pointing out that while a "topographical officer . . . is collecting in his military operations the knowledge necessary for military defenses of the country, he also collects matter improving its geography and bearing essentially upon its commercial and argicultural prosperity."[65] In 1832, Secretary of War Lewis Cass simply stated that "the numerical strength of the engineer corps is not now sufficient for the performance of the duties required of its officers."[66]

Despite the shortage of engineers, this statement by Secretary Cass was an exaggeration. The Army Engineers performed admirably and efficiently in surveying and constructing early transportation systems throughout the nation.

In the Maryland area they were associated with major transportation projects that were designed to connect the Atlantic coast with the expanding western frontier. They were directly in charge of repairing the Cumberland Road, making it passable once again. They loaned personnel to the Chesapeake and Delaware and the Chesapeake and Ohio Canals to survey and to supervise construction. Most important, they helped build the nation's first railroad, the Baltimore and Ohio, plotting the route and bringing it through its initial construction phase. They also aided the Baltimore and Susquehanna Railroad lay track through Maryland to the Pennsylvania line.

Besides these major achievements, there were other less dramatic activities by the Army Engineers in the area.

For example, in 1826, Col. James Sewall of the Army Corps of Engineers surveyed a proposed postal road from Baltimore to Philadelphia.[67] In 1836 Topographical Engineer Brevet Lt. Col. James Kearney surveyed a route for a railroad on the Eastern Shore of Maryland under a resolution of the Maryland state legislature asking for the services of a government engineer.[68] All of these actions taken together clearly document the major contributions of the Army

Corps of Engineers in the development of early internal improvements in Maryland and the surrounding region. And although the Corps of Engineers role in planning internal improvements had temporarily declined by 1838, its involvement in civil works remained a permanent part of its functions.

Footnotes to Chapter II

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[2]Jeremiah S. Young, "A Political and Constitutional Study of the Cumberland Road." Published Ph.D. dissertation, Univ. of Chicago, 1904, pp. 39-41.

[3]Albert Gallatin, Rpt. on Roads and Canals, 10th Cong., 1st sess. 6 Apr. 1808. In *Amer. St. Papers; Misc.*, vol. I, doc. 250, pp. 724-921.

[4]*Ibid.*, p. 725.

[5](1) Young,"Political and Constitutional Study of Cumberland Road," pp. 50-54. (2) Carter Goodrich, *Government Promotion of American Canals and Railroads, 1800-1890* (New York: Columbia Univ. Press, 1960), pp. 37-38. (3) Forest G. Hill, *Roads, Rails and Waterways: The Army Engineers and Early Transportation* (Norman: Univ. of Oklahoma Press, 1957), p. 39.

[6]John C. Calhoun, Rpt. on Roads and Canals, 14 Jan. 1819. In *The Works of John C. Calhoun*, Richard K. Cralle, ed. (New York: D. Appleton & Co., 1859) vol. V, p. 50.

[7]*Ibid.*, pp. 50-51.

[8]Philip D. Jordan, *The National Road* (Gloucester, Mass.: Peter Smith, 1966), pp. 103-105.

[9]Ltr., David Shriver, Jr., to Gallatin, 14 Jan. 1812. Nat. Archives, Rec. Gp. 77, entry 179, box 1.

[10](1) Ltr., Shriver to Gallatin, 21 Dec. 1812. (2) Ltr, Shriver to Actg. Sec. Treas. William Jones, 31 Dec. 1813. (3) Ltr., Shriver to Sec. of Treas. Alexander J. Dallas, 18 Dec. 1814. Nat. Archives, Rec. Gp. 77, entry 179, box 1.

[11]Ltr., Shriver to Dallas, 30 Dec. 1815. Nat. Archives, Rec. Gp. 77, entry 179, box 1.

[12]*Ibid.*, 12 June 1816. Nat. Archives, Rec. Gp. 77, entry 179, box 2.

[13]*Ibid.*

[14]Ltr., Shriver to Sec. Treas. William Crawford, 7 Jan. 1817. Nat. Archives, Rec. Gp. 77, entry 179, box 2.

[15]*Ibid.*, 1 June 1818. Nat. Archives, Rec. Gp. 77, entry 179, box 3.

[16]*Ibid.*, 19 March 1819.

[17]James Monroe, "Veto of the Bill for the Preservation and Repair of the Cumberland Road," H. Doc. 127, 20th Cong., 2nd sess., 4 May 1822. In *Roads and Canals*, vol. VI.

[18]*Annals of Congress*, 18th Cong., 1st sess., 30 Apr. 1824, p. 3217.

[19]Hill, *Roads, Rails and Waterways*, p. 128.

[20]*Ibid.*, p. 214.

[21](1) Ltr., Shriver to Crawford, 5 Apr. 1823. Nat. Archives, Rec. Gp. 77, entry 179, box 4. Congress appropriated $25,000 for repairing the road in 1823. (2) Young, *Pol. and Const. Study of Cumberland Road*, p. 79.

[22]Rpt., Alexander Macomb, C. of Engrs., 20 Nov. 1827. Pt. of Annual Rpt. of Sec. War, 20th Cong., 1st sess., 4 Dec. 1827. In *Amer. St. Papers; Mil. Aff.*, vol. III, doc. 360, p. 631.

[23]Annual Rpt., Sec. of War Lewis Cass, 22nd Cong., 1st sess., 6 Dec. 1831. In *Amer. St. Papers; Mil. Aff.*, vol. IV, p. 710

[24](1) Ltr., Gratiot to Mansfield, 23 Jul. 1832. In Thomas Brownfield Searight, *The Old Pike;* Joseph E. Morse and R. Duff Green, eds. (Orange, Va.: Green Tree Press, 1971), p. 153. Lt. Joseph K. F. Mansfield was the nephew of Jared Mansfield, Ohio surveyor and USMA professor, and cousin of newspaperman and author Edward Deering Mansfield. (2) Annual Rpt., C. of Engrs., 23 Nov. 1833. In *Amer. St. Papers; Mil. Aff.*, vol. V, doc. 551, p. 189.

[26]Ltr., Mansfield to Gratiot, 1 Aug. 1832. Nat. Archives, Rec. Gp. 77, entry 180.

[27]Gratiot reported that "Lieutenant Mansfield, the officer who had temporary management of the affairs of this road, has done all that zeal, aided by sound judgment, could effect." Annual Rpt., C. of Engrs., 13 Nov. 1832. Pt. of Annual Rpt., Sec. War, 22nd Cong., 2nd sess., 4 Dec. 1832. In *Amer. St. Papers; Mil. Aff.*, vol. V, doc. 532, p. 49.

[28]Ltr., Delafield to Gratiot, 13 Dec. 1832. Nat. Archives, Rec. Gp. 77, entry 180.

[29]Ltr., Delafield to Pickell, 13 Apr. 1833. Nat. Archives, Rec. Gp. 77, entry 180.

[30]Ltr., Delafield to Gratiot, 11 May 1833. Nat. Archives, Rec. Gp. 77, entry 180.

[31]*Ibid.*, 6 May 1833.

[32]Ltr., Gratiot to Delafield, 8 May 1833. Nat. Archives, Rec. Gp. 77, entry 180.

[33]*Ibid.*, 11 June 1833.

[34]Annual Rpt., C. of Engrs., 23 Nov. 1833. In *Amer. St. Papers; Mil. Aff.*, vol. V, p. 188.

[35]Ltr., Delafield to all sec. officers, 29 May 1834. Nat. Archives, Rec. Gp., 77, entry 180.

[36]*Ibid.*

[37]Ltr., Delafield to Gratiot, 23 Jul. 1834. In Searight, *Old Pike*, pp. 158-159.

[38]See ltrs., Gratiot to Sec. War Lewis Cass, 28 Jul. 1834; from Asst. Sec. War John Forsyth to Gratiot, 28 Jul. 1834; from James Thomas, Gov. of Md. to Cass, 10 Sept., 1834. In Searight, Old *Pike* p. 162.

[39]Capt. Richard Delafield, Rpt. on Cumberland Road, 14 Nov. 1837. Pt. of Annual Rpt. of Sec. War, 25th Cong., 2nd sess., 5 Dec. 1837. In *Amer. St. Papers; Mil. Aff.*, vol. VII, doc. 745, p. 698.

[40]Sec. of War, Rpt. on Internal Improvements. S. Doc. 115, 24th Cong., 2nd sess., 24 Jan. 1837. In *Roads and Canals*, vol. XXXVIII, p. 17.

[41]Annual Rpt., Sec. War, 24th Cong., 1st sess., 8 Dec. 1835. In *Amer. St. Papers; Mil. Aff.*, vol. V doc. 613, p. 628.

[42]Frederick Jackson Turner, *Rise of the New West: 1819-1829* (New York: P. F. Collier & Sons, 1962), pp. 84-85.

[43]Rpt. by Md. Commissioners on proposed canal from Baltimore to Conowingo, 25 Nov. 1823; in *Roads and Canals*, vol. XLVI, p. 2.

[44]Rpt. of Bd. of Engrs., 20 Nov. 1823. Pt. of Rpt. on State of Mil. Establishment, 18th Cong., 1st sess., 2 Dec. 1823. In *Amer. St. Papers; Mil. Aff.*, vol. II, doc. 247, p. 568.

[45]James W. Livingood, *The Philadelphia-Baltimore Trade Rivalry, 1780-1860* (Harrisburg: Pennsylvania Historical and Museum Commission, 1947), pp. 54-80.

[46](1) Ralph D. Gray, *The National Waterway: A History of the Chesapeake and Delaware Canal, 1769-1965* (Urbana: Univ. of Ill. Press, 1967), pp. 47-49, 51-52, 64-66. (2) Address of Pres., C & D Canal, 18 Feb. 1845. In *Roads and Canals*, vol. XLV, p. 4. A railroad built parallel to the Canal in 1832 deprived it of much of its business. (3) Livingood, *Philadelphia-Baltimore Trade Rivalry*, p. 95.

[47]Bd. of Engrs., Rpt. on Internal Improvements, H. Doc. 32, 18th Cong., 2nd. sess., 14 Feb. 1825. In *Roads and Canals*, vol. VII, p. 45.

[48]Bd. of Engrs., on C & O Canal, H. Doc. 10, 19th Cong., 2nd sess., 23 Oct. 1826. In *Roads and Canals*, vol. VIII, p. 66.

[49]Walter S. Sanderlin, "A History of the Chesapeake and Ohio Canal." (College Park: Univ. of Md., 1945) p. 45.

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[51]Hill, *Roads, Rails and Waterways*, pp. 100-101.

[52]Annual Rpt., Sec. War, 20th Cong., 1st sess., 4 Dec. 1827. In *Amer. St. Papers; Mil. Aff.*, vol. V, doc. 360, p. 616.

[53](1) Forest G. Hill, "Government Engineering Aid to Railroads Before the Civil War," *Jnl. Econ. Hist.*, IX (1951), 238. (2) The stanard biography of Long is Richard G. Wood, *Stephen Harriman Long, 1784-1864: Army Engineer, Explorer, Inventor* (Glendale, Calif.: Arthur H. Clark Co., 1966).

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[56]Memorial of President and Directors of the Baltimore and Ohio Railroad Company, 23 Dec. 1823, H. Doc. 48, 20th Cong., 1st sess. In *Roads and Canals*, vol. V.

[57](1) Rpt. of Sen. Comm. on Roads and Canals, S. Doc. 73, 20th Cong., 2nd sess., 11 Feb. 1829. In *Roads and Canals*, vol. XIII. (2) Between 1827 and 1830, fourteen Army engineers worked on the B&O Railroad: Col. Stephen H. Long, Maj. William G. McNeill, Dr. William Howard, William B. Guion, William Harrison, and Lieutenants George W. Whistler, Joshua Barney, William Cook, John N. Dillahunty, Walter Gwynn, John M. Fessenden, Richard E. Hazzard, William B. Thompson and Isaac R. Trimble. Hill, *Roads, Rails and Waterways*, p. 105.

[58](1) *Ibid.*, 103-104. (2) Edward Hungerford, *The Story of the Baltimore and Ohio Railroad, 1827-1927* (New York: Books for Libraries Press, 1972), vol. I, p. 69.

[59]William Gibbs McNeill, "Narrative of Proceedings of the Board of Engineers of the Baltimore and Ohio Railroad Company, Containing An Exposition of Facts, Illustrative of the Conduct of Sundry Individuals" (1830). In *Roads and Canals*, vol. LII.

[60]Carroll Bateman, *The Baltimore and Ohio: the story of the railroad that grew up with the United States* (Baltimore: Baltimore and Ohio Railroad, 1951).

[61]Reizenstein, "Economic History of the Baltimore and Ohio Railroad," pp. 72-84.

[62]Third Annual Report of the Directors to the Stockholders of the Baltimore and Susquehanna Railroad Company, 18 Oct. 1830. In *Roads and Canals*, vol. LIII.

[63](1) Annual Rpt. of Topo. Bur., 7 Nov. 1831. Pt. of Annual Rpt. of Sec. War, 22nd Cong., 1st sess., 6 Dec. 1831. In *Amer. St. Papers; Mil. Aff.*, vol. IV, doc. 485, p. 766. (2) Annual Rpt. of Topo. Bur., 19 Oct. 1833. Pt. of Annual Rpt. of Sec. War, 23rd Cong., 1st sess., 3 Dec. 1833. In *Amer. St. Papers; Mil. Aff.*, vol. V, doc. 551, p. 218. (3) Ninth Rpt. of Pres. and Dirs. to Stockholders of Baltimore & Susquehanna RR Co., Oct 1836. In *Roads and Canals*, vol. LIII. (4) Henry B. Mayer and Caroline E. MacGill, *History of Early Transportation in the U.S. Before 1860* (New York: Peter Smith, 1948), pp. 412-413.

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[66]Statement by Sec. War Lewis Cass, 25 Nov. 1832. Pt. of Annual Rpt. of Sec. War, 22nd Cong., 2nd sess., 4 Dec. 1832. In *Amer. St. Papers; Mil. Aff.*, vol. V, doc. 532, p. 19.

[67]Survey of Routes for a Post Road from Baltimore to Philadelphia. Signed by Simon Bernard and William T. Poussin; H. Doc. 94, 19th Cong., 2nd sess., 12 Feb. 1827. In *Roads and Canals*, vol. XV.

[68]Rpt. of Topo. Bur. of Engr. Dept. of U.S. Sen., 24th Cong., 1st sess., 24 Jun. 1836. In *Amer. St. Papers; Mil. Aff.*, vol. VI, doc. 697, p. 796.

Chapter III

Structures For Defense: Fort Carroll, Fort McHenry and the Civil War

While the Army Corps of Engineers found itself increasingly occupied with internal improvements after 1824, it did not relinquish its military responsibility for erecting fortifications to protect the young country from attack. Along the Atlantic coast the War of 1812 had been a humiliating experience with President James Madison having to flee Washington as the capital burned and Baltimore heroically staving off a serious bombardment and an assault. In the future it would be best if the enemy never got so close.

The first priority was to protect the entrance of 200-mile-long Chesapeake Bay. As early as 1818, the War Department determined to fortify the mouth of the bay with two structures at Hampton Roads, Virginia, one at Old Point Comfort later named Fort Monroe, and the other upon Rip Rap Shoals to be called Fort Calhoun.[1] This was to be the first line of defense for Chesapeake Bay. Later, structures would be erected inside the bay at Baltimore harbor to defend the city in case an invader penetrated past the fort at Hampton Roads. "In the Chesapeake," the Board of Engineers for fortifications observed in 1821, "the projected works at the entrance of Hampton roads have for (their) object to close this road against an enemy, and to secure it to the United States."[2] When the fortifications at Hampton Roads were nearly completed, work would begin on structures farther up the bay.

The Board of Engineers anticipated erecting two forts around Baltimore, one at the extreme end of Sollers Point Flats, and the other at Hawkins Point, seven miles below the city on the Patapsco River. These defenses would force an invader to land at a longer distance from the city, make his march long and costly, and prevent direct bombardment by water. Fort McHenry would be retained as a secondary barrier.[3]

By 1823, Fort Monroe had walls ten feet thick and twelve feet high. Progress at Fort Calhoun was slower because the settling of the foundation necessitated frequent reinforcement. To prevent it from sinking into the sea, tons of stones had to be added to Rip Rap Shoals upon which the fort was to stand. While Fort Monroe was completed by 1833, engineers had to wait until it appeared the foundation had stabilized before starting to build walls for Fort Calhoun.[4]

Meanwhile, citizens of Maryland and Baltimore were growing impatient waiting for construction to commence on the fortifications in their region of Chesapeake Bay. The Maryland General Assembly urged that the timetable for erecting seacoast fortifications be speeded up. In a resolution to the U.S. Congress in 1832, the Assembly emphasized that "the establishment of fortifications throughout our borders should be persevered in as essential to the security of the important outlets of our commerce, and at the same time to give additional maritime strength to the Atlantic States."[5]

The Chief of Engineers, Brevet Brig. Gen. Charles Gratiot, in his Annual Report for 1831, recommended that construction begin immediately at Sollers Point Flats. He reiterated this advice during the next several Annual Reports, stressing that Baltimore's proximity to the bay placed the city in a dangerous position. He warned that "an enemy can, in a few hours' march, without being exposed to a separation from his fleet, after an easy landing make himself master of that great commercial depot."[6] The House of Representatives Committee on Military Affairs, while acknowledging that Baltimore was militarily vulnerable, agreed with the War Department that the forts at Hampton Roads should have first priority. Completing these structures made the hurrying of the building of forts around Baltimore less imperative.[7] Their eventual construction, however, was still contemplated. In 1836, Secretary of War Lewis Cass estimated that the cost to properly defend Baltimore, including building two forts and repairing Fort McHenry, would be more than $1.5 million.[8] Later that year, the War Department berated Congress for its haphazard appropriations for all fortifications. The Secretary of War complained:

> The failure during the session of 1834-35 of the bill containing the usual appropriations for fortifications occasioned a suspension of those works during the year 1835; and though liberal appropriations for resuming them were made at the last session of Congress, yet it unfortunately happened that the season for active operations was too far advanced. . .to allow of much progress during the present year. Operations have been also retarded. .by the insufficiency of the Engineer department to furnish an adequate number of engineers to superintend the construction.[9]

II

Congress did appropriate money for repairs to Fort McHenry in 1829. Thus began a ten-year period of intensive renovation. Capt. James W. Ripley, 4th Artillery, was in charge of the extensive modifications in 1829 and 1830, including raising of the barracks from one and a half to two stories and building a roof over the vault of the sally port. During late July 1829, a stiff wind blew down the second-story wall of one block of soldiers' quarters. Despite this setback, all four barracks acquired their second floors and covered porches that year.[10]

Throughout this period, the fort's drainage system continued to cause trouble. The sloped earthen bank that separated the terreplein (a level platform behind a parapet or rampart, where guns are mounted) from the parade-ground level failed to stop rain water from seeping into the fort's foundations and cellars causing dampness and rotting of the wooden floors above. On 30 September 1833, Brevet Capt. Henry A. Thompson, nephew of Chief of Engineers Charles Gratiot, arrived at the fort to supervise the replacing of the sodded slope with a brick wall.[11]

Thompson remained at McHenry until December 1839. During his tenure he worked closely with Gratiot in improving the fort. Among the many repairs made by Thompson was an attempt to alleviate the dampness in the magazine. Thompson filled the magazine cellar with earth and covered it with brick. At the same time he added to the brick lining of the interior walls. Later he installed a shutter to the rear window of the magazine and placed a row of 7/8-inch-diameter iron bars across the opening a foot inside the walls.[12]

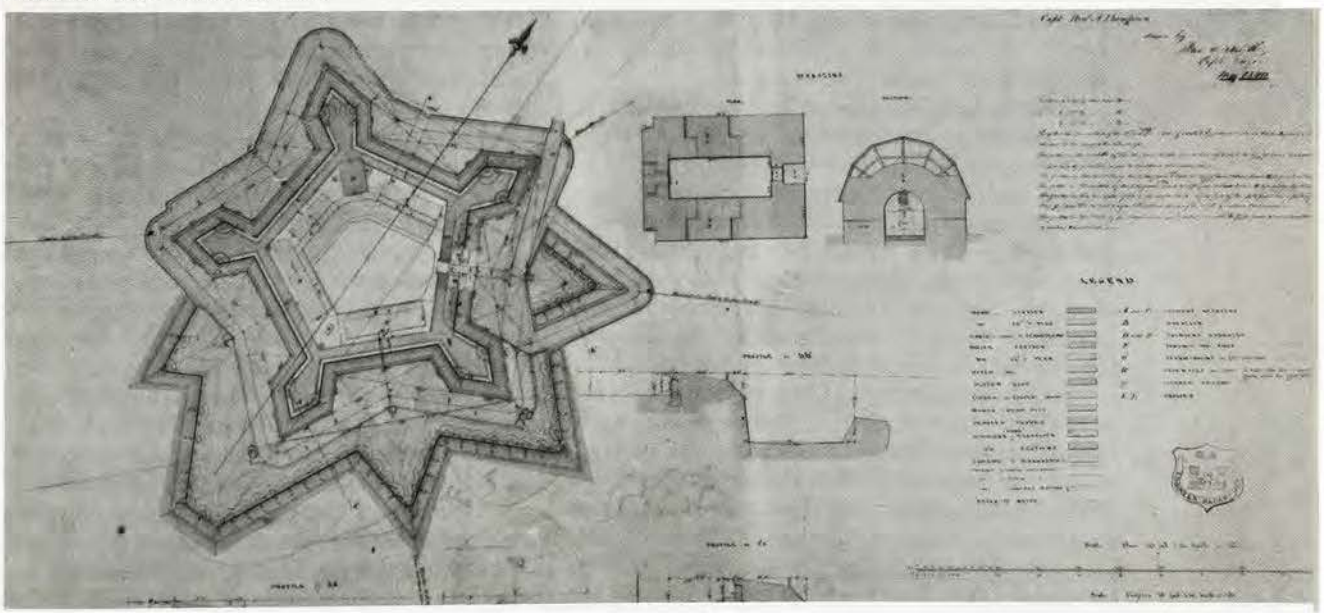
In August 1836, the army cleared the fort of all troops because of the extensive repairs. During the next four years, Thompson, under the Engineer Department, renovated buildings and constructed a seawall and a boundary wall. He added two guard rooms in 1835 by cutting away fifteen feet from the bombproof rooms on each side of the sally port.[13] In his report to Gratiot in 1837 Thompson proudly noted that the scarp wall had been entirely repaired and the new outer battery and seawall were nearly finished. Improvements to barracks included filling in the cellar kitchens and adding brick kitchens at ground level, completing indoor and outdoor painting, and replacing the shingled roofs with a new zinc covering. By the end of 1839 the Engineers considered the repairs complete and returned the fort to the Artillery. Between 1829 and 1839, over $100,000 had been spent on the alterations to the old star fort.[14] In addition, land had been purchased in order to enlarge the twenty-three-acre reservation upon which the fort stood. There were privately owned buildings within a few feet of the fort, including a tavern. In 1827, the Engineer Department

concluded that the purchase of additional land adjoining the fort was unnecessary because it was "to be retained only as an accessory to the system for the defense of the maritime frontier."[15] In 1831, however, the Engineer Department reversed its position. Apparently having a tavern so close to the barracks was too much of a temptation. Besides, more land was needed for the outer battery. Finally, in 1837 the government purchased fifteen acres.[16]

Between 1840 and 1860, Army Engineers undertook only minor alterations at Fort McHenry. Because of incessant leaking, in 1843 the zinc roofs on the quarters had to be replaced by tin. In October 1844, the Chief of Engineers assigned First Lt. Pierre G. T. Beauregard to Baltimore. Beauregard, who became famous as a Confederate general, added an outside door to the magazine, repaired the walls of the sally port, graded ditches to improve drainage, and repaired the terreplein and the counterscarp (the outer slope or wall of a ditch or moat in a fortification) on the southeast and northeast fronts. All this work was finished before the end of 1845.[17]

General P. G. T. Beauregard, the famous Confederate army officer, supervised repair at Fort McHenry during 1844. U.S. Signal Corps.—National Archives

Outline drawing of the star structure of Fort McHenry after intensive renovations 1840.—National Archives



Fort McHenry had never been in such fine condition. But in 1844 the Chief of Engineers, Brevet Brig. Gen. Joseph G. Totten, questioned its usefulness in case of an attack. "The great city of Baltimore," he wrote, "is now defended by Fort McHenry alone; a work of inferior force and so placed near the city as to bear no action upon any other attack than one directly up the inner harbor." He pointed out that an enemy could land at North Point, invade downtown Baltimore and totally ignore Fort McHenry. New fortifications farther out in the Patapsco River were mandatory.[18]

III

Not until 1847 was work begun on the fort at Sollers Point Flats, seven miles outside of Baltimore near mid-channel in the Patapsco River. The original design for the proposed fort, formulated by the Board of Engineers in 1818, called for a seven-sided island fort without flanking arrangements. The Board later modified its design to a regular hexagon containing three tiers of guns in casemate and one in barbette.[19]

Preliminary arrangements for definitely locating the fort and proceeding with construction began in July 1847 under direction of Maj. Cornelius A. Ogden (USMA 1819). Ogden had previously superintended the building of Fort Morgan in Mobile Bay, Alabama, and the Cumberland Road in Indiana and Illinois. For a year Ogden surveyed the Sollers Point Flats area, preparing to construct an artificial island upon which the fort would be erected.

In October 1848 Ogden reported to Chief of Engineers Totten that he had rented property on Sollers Point Flats and built "a Depot and framing yard and quarters for officers, mechanics, and laborers, work shops, and stables. .A wharf has been made for this landing of materials and a pen for securing lumber."[20] Ogden remained in Baltimore until 15 November, when Brevet Col. Robert E. Lee took over the command. It is with the beginning of Ogden's tour of duty at Sollers Point Flats that the drawings and miscellaneous files of the Engineers in the area were kept as part of the records of the Baltimore District. But the District likes to refer to the famous Civil War Confederate general, Robert E. Lee, as its first District Engineer. Whether Lee was ever referred to as District Engineer is debatable. His successor, Capt. Henry Brewerton, definitely used that title. Nevertheless, Lee is certainly the most famous member of the Army Corps of Engineers to have served in the Baltimore District.

Robert E. Lee, born in Virginia on 19 January 1807, graduated number two in the class of 1829 of the Military Academy. As a second lieutenant in the Corps of Engineers he served as assistant engineer during construction of Forts Monroe and Calhoun from 1829 through 1834. He spent the next three years in Washington, D.C. as assistant to the Chief of Engineers. From 1837-1841 he was the superintending engineer for the harbor at St. Louis, Missouri, and from 1841-1846 he supervised the construction at Fort Hamilton in New York harbor in what is now Brooklyn. His first combat experience came during the War with Mexico, where he served as chief engineer of troops commanded by Brig. Gen. John E. Wool. Wounded during the storming of Chaputltepec in September 1847, Lee was brevetted colonel for gallant and meritorious conduct during the war. Thus, by the time Lee arrived in Baltimore, he had already distinguished himself in a wide variety of engineering duties.[21]

For three years and five months Lee supervised the building of the fort at Sollers Point Flats. During that time he lived with his family in a three-story brick house on Madison Avenue in Baltimore. Each day he commuted to the harbor by horse-drawn bus where two oarsmen met him and rowed him to Sollers Point and, after construction started, out to the flats.[22]

Because the fort was to be erected on a shoal, Lee's first task was to examine the character of the shoal and the strength of the foundation it would provide. Stormy weather in April 1849 caused delay. By the end of the summer, however, Lee concluded "that a firm foundation could be reached at 45 feet below low water level." He arranged to procure piles that would be long enough for the platforms of the sea walls and directed the building of a crane to lift stone and other heavy materials. Finally, during the summer of 1849, laborers dug a thirty-seven-foot well to supply fresh water for use of the men and steam engines employed on the work.[23] Lee contracted malaria during July, forcing him to retreat to Arlington, Virginia to recuperate. He did not

return until the end of August.[24]

In his report for 1850 Lee could recount considerable progress. Constructing wharves for two of the fronts of the fort had been erected and those of the other four fronts were well on their way toward completion. A steam pile-driver had been employed to drive piles twelve to fifteen feet into the water. To construct the artificial island, workers had placed wooden grillage on top of the piles and covered it with stone and mud. A diving bell and a dredge had been built to level and grade the foundation for the sea walls. With prospects bright that the proposed fort would eventually be completed, the War Department decided to give it an official name. On 8 October 1850, it decided that the fort at Sollers Point Flats was to be called Fort Carroll in honor of Charles Carroll, signer of the Declaration of Independence and the gentleman who more than twenty years earlier had laid the cornerstone for the Baltimore and Ohio Railroad.[25]

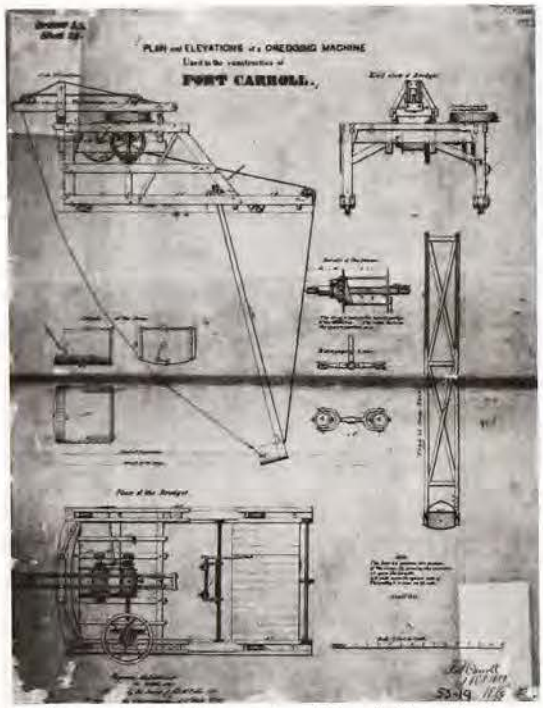
During his last full year in Baltimore, Lee became frustrated in his work. A peak had been reached early during the fort's construction; making further headway proved arduous. Building a fort on an artificial island was fraught with dangers. A shaky substructure would not support a four-story building forty feet high with six sides 246 feet long mounting 350 cannons. Lee worried that worms might destroy the foundation piles. He was further hampered by the failure of Congress in 1851 to appropriate any new funds for the fort. Work had to be restricted within the limits of the cash on hand. Nevertheless, in his report of 1 October 1851, Lee noted that the wharves on all fronts were nearly complete. Three hundred thirty-two foundation for the seawall on Front 1 had driven and sawed off fifteen feet below low-water level and were ready for masonry. The foundation for the sea wall on Front 1 had been graded and leveled, and three courses of stone laid. Lee procured enough stone to make the wall fourteen feet high. Finally, he supervised the building of a carpenter and blacksmith shop on the site of the fort.[26]

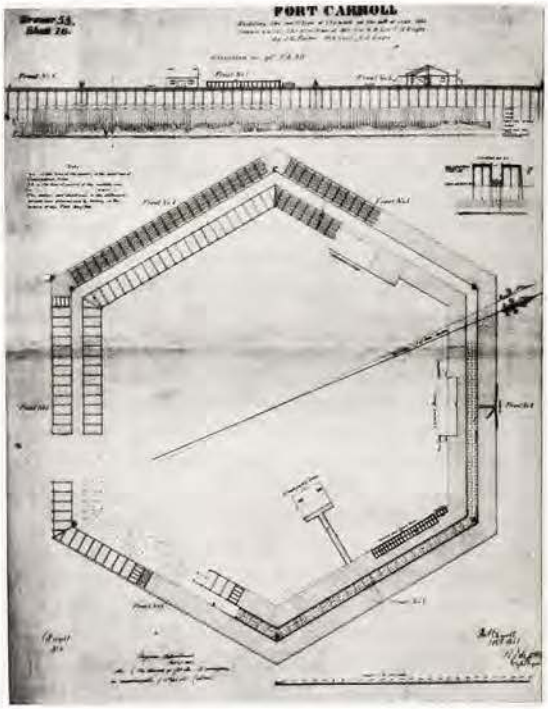
Col. Lee remained in charge of the building of Fort Carroll until 27 May 1852, when Gen. Totten assigned him to become superintendent of the United States Military Academy at West Point. His active days as an engineer in the United States Army were over. They ended in Baltimore working on a tedious project which became stalled because of a lack of funds. Congress was questioning the fort's practicality. As Douglass Southall Freeman, Lee's biographer, notes, the Fort Carroll experience "with the slow and troublesome construction of stone forts of the old type unconsciously operated to make him still more an advocate of earthworks."[27]

Robert E. Lee—National Archives

IV

Capt. Henry Brewerton arrived in Baltimore in October 1852 to become superintending engineer for the construction of Fort Carroll. Twice he contracted the "black plague fever" during previous stints of duty in the Mississippi Delta and at Charleston





Dredging machine used to excavate sand from the floor of the Patapsco River for deposit within the walls of Fort Carroll, September 1851.— National Archives

harbor, South Carolina. He also toiled on the Cumberland Road in Ohio and was superintendent of the Military Academy from 1845 until his transfer to Baltimore.

At Fort Carroll the vigorous, zealous Brewerton found a structure still in its preliminary phase of construction that had already cost $1 million.[28] Congressional misgivings about the worthiness of the project meant no new funds until 1853. And the lateness of the $50,000 appropriation of that year combined with illness to prevent the start of any work. "Sickness . during the months of July, August and September," a discouraged Brewerton lamented, ". has prevented our obtaining a sufficient force of mechanics or laborers and has very materially affected the progress of the Work."[29] He did manage to hire enough men to build the frame of a wooden lighthouse at the fort. In December he happily reported that it was ready to receive its lantern. He estimated that the price of the French plate glass needed for the lighthouse would be between $75 and $100. Proper operation of the lighthouse required a small temporary building to be used for oil storage. The lighthouse received its lantern during the next year and its keeper became the island's only permanent resident.[30]

During the next couple of years one crisis after another plagued Fort Carroll. A severe gale on Christmas Eve in 1854 heavily damaged the preparatory wharves and the sea wall on Front 3.[31] On the night of Sunday, 21 January 1855, the wind that ripped into the temporary wharf at Front 6 left little standing in its path. The greatest loss, however, turned out to be the displacement of the sheet piles. The engine used to drive in these piles had already been dismantled. Brewerton regretted that "we shall therefore in all probability, have to resort to a hand machine for redriving these piles."[32]

Ice demolished some of the outer wharfing in March 1856 and almost carried out to sea the foundation pile driver situated on Front 4. A dozen men had to be called to retrieve the machine, "the loss of which at this time," Brewerton sighed, "would materially retard our operations . . . ."[33]

Threats from storms constantly torment-

ed the fort, but in the spring of 1855 it was human error which caused the damage. On Thursday morning, 17 May, a steamer named *Planter* that ran full speed into the fort destroyed some outer wharfing on Front 5. "I look upon this collision as the result of pure carelessness," Brewerton complained. This was the second time this same steamer had crashed into the fort.[34]

Despite these setbacks, some progress could be measured. In the fall of 1855, Brewerton reported that the seawalls had been filled with concrete and were complete. Seven hundred twenty-two pieces of cut granite had been laid in these walls with the aid of the diving bell. In addition, the piling for the foundation of the scarp wall and piers had been started.[35] Two years later, all the piles for the foundation had been driven in place and sawed off on Fronts 2, 3 and 4. The grillage was in the process of being constructed on these fronts. A steam dredge employed at the fort excavated 52,319 cubic yards of sand from the bed of the Patapsco River in 1857 alone and deposited it within the interior of the fort's walls. The whole quantity of filling amounted to 85,561 cubic yards, and Brewerton considered that this volume would be sufficient. Also in 1857 began the sinking of a new artesian well to renew the supply of fresh water, and the construction of a permanent wharf.[36]

By the end of 1858 all the foundation piles had been sawed off and the entire grillage timber laid. The scarp wall had been raised on all six fronts of the fort to heights varying from eighteen to twenty-four feet. In additon, foundations for two magazines were now in place.[37]

But new troubles continued to arise. As the Civil War approached, it seemed increasingly doubtful that Fort Carroll would ever be completed. Settling on Front 6 brought a halt to building of the scarp wall in 1859.[38] During that same year the laborers working at the fort complained bitterly about the quality of the food they were being served. The lieutenant temporarily in charge admonished the board master to improve his culinary efforts or face dismissal. Over the past several months the board for each person had not averaged more than 35 cents a day, while the board master was being paid 40 cents a day for each laborer. The lieutenant warned "that there is no excuse for giving the laborers bad board on the ground of insufficient pay. I must urge you to give your personal and constant attention to the board of the laborers, and request that you will *at once* bring the quality of the board up to that required . . . ."[39]

Also during 1859 the contractors digging the artesian well ran out of funds. The well was already 159 feet deep. The contractors needed more pipe, but they claimed they had already spent nearly the whole amount of the contract price.[40]

Certainly by 1861 and the opening of the Civil War, Fort Carroll was not a reliable defensive structure which could be counted upon to protect the city of Baltimore. The scarp walls continued to sink from settling, particularly on Fronts 5 and 6, halting all construction. The engineers did load more than 3,300 tons of rough granite into Front 6 to try to prevent further subsidence. Forty-four guns had been mounted on the fort's other five fronts. Unfortunately, Front 6 had the best bearing on the channel.[41]

V

During the tense winter of 1860-61 the city of Baltimore was torn apart internally between loyalties to the North and the South. The firing on Fort Sumter, South Carolina in April 1861 accelerated the level of excitement. Baltimore seethed, when on 19 April 1861, the 6th Massachusetts Infantry of some 1,200 volunteers answering President Abraham Lincoln's call for soldiers, passed through the heart of the city on their way to Washington. Southern sympathizers and secessionists attacked the Massachusetts volunteers and a riot ensued. Thirteen Baltimoreans and four of the Massachusetts soldiers died in the bloody melee. For the next couple of weeks Baltimore remained isolated from federal control.

Then, on 13 May, a strong Union force, commanded by Brig. Gen. Benjamin F. Butler, of the Massachusetts volunteers, marched into the city, seized Federal Hill and trained some guns on the town. From his position Butler could easily dominate the harbor and the city's business district. It is reported that he threatened, at the first sign of trouble, to blow up the local Washington Monument that had been erected in 1829. From this point on throughout the war Baltimore was a

captive city under martial law. It became an armed camp with federal troops patrolling the streets and garrisoning the fortifications ringing the city.[42]

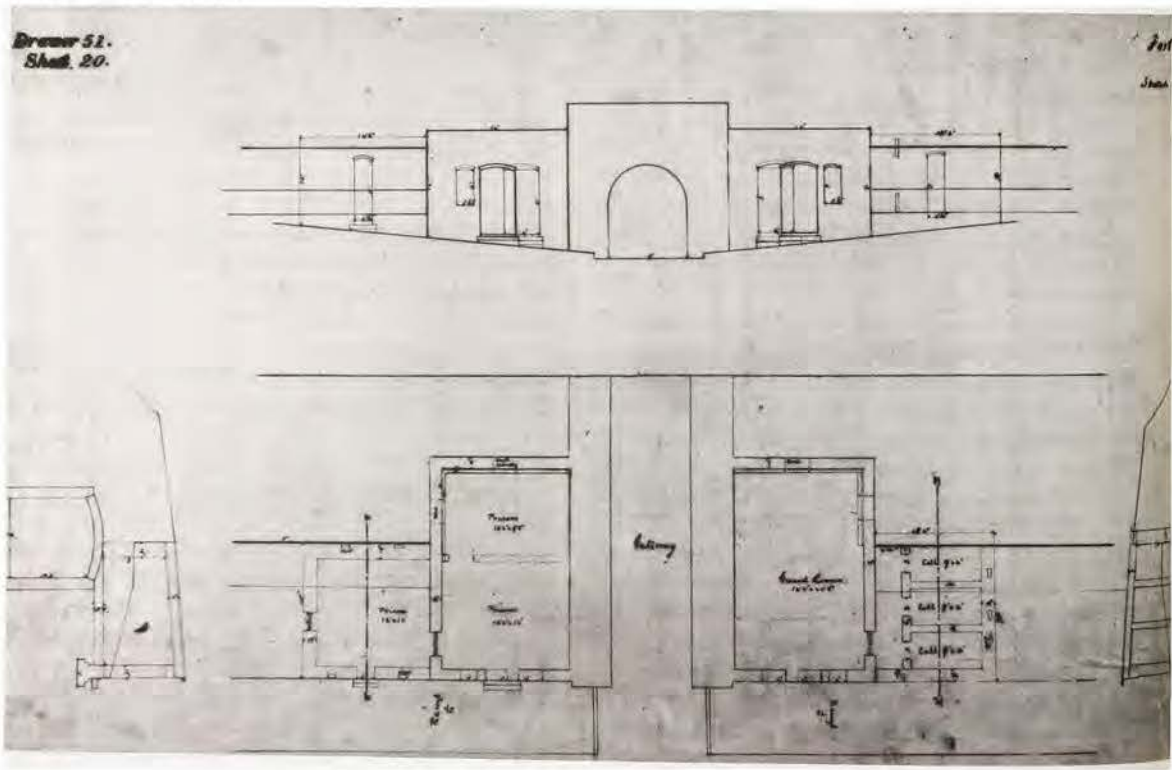
It was the job of now Lt. Col. Henry Brewerton and the Engineers stationed in the area to construct these fortifications. Brewerton now was sixty years old and in ill health which precluded combat service, but he did remain in charge of fortifications in Baltimore through most of 1864.

Other than Fort Carroll, little attention had been paid to fortifications in the Baltimore and the Maryland areas in the years immediately preceding the war. At Annapolis proposals for improving Fort Madison literally went up in smoke when in 1857 fire destroyed the survey plans for the structure. The next year, Capt. Montgomery C. Meigs supervised a resurvey and a rebuilding of the wharf, besides raising the height of the sea wall and removing the foundations of the old fort.[43]

Brewerton inspected Fort McHenry in the spring of 1856 and found the officers' and soldier's quarters in drastic need of repair. The roof leaked in the commanding officer's quarters. The soldiers' quarters were so dilapidated they were scarcely worth fixing. Two other brick buildings for soldiers required new floors and ceilings. The sea walls needed restoration and painting.[44]. During the next year Brewerton made additions to the guardhouses constructed on the sides of the sally-port entrance. The extension of the north side served as a guardhouse during the Civil War while the southern annex, which had been divided into prison cells, housed Confederate prisoners. Eventually, the entire Fort McHenry reservation became a detention center for those suspected of pro-Confederate activities.[45]

With the outbreak of hostilities the pace of work on Baltimore's fortifications quickened. What mattered in 1861 was keeping the city's defenses strong against possible Confederate attack. Brewerton furnished sandbags for Fort McHenry and arranged for laying down temporary traverse circles at Fort Carroll designed to accommodate five guns on each front.[46] At Federal Hill, high overlooking both the harbor and the down-

This drawing outlines the additions to the guard houses built on the sides of the sally port entrance at Fort McHenry by Major Henry Brewerton in 1857.—National Archives

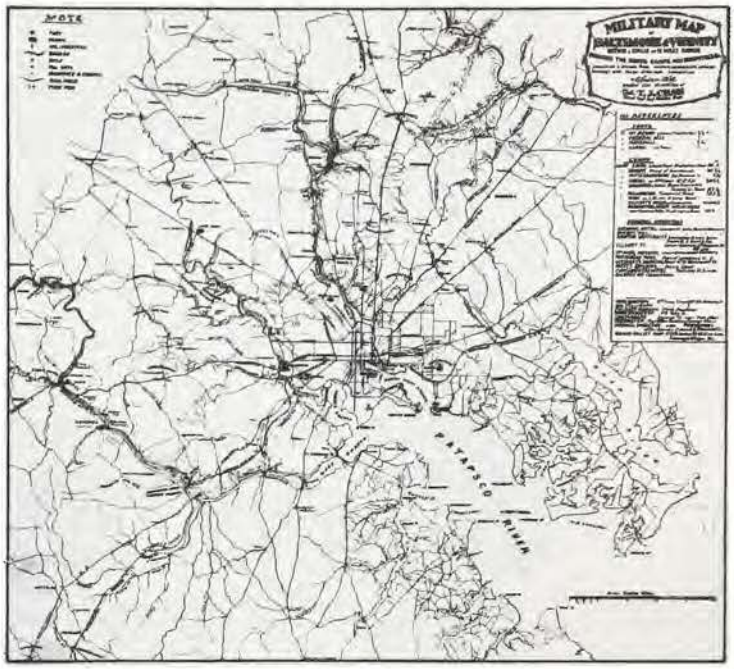


town business district, Brewerton supervised from 250 to 400 men of a New York State volunteer regiment as well as eighty mechanics and laborers and eighteen horses and carts in constructing emergency intrenchments.[47] By November he reported Federal Hill fully armed. At the same time Brewerton was overseeing the erection of a temporary earth fortress named Fort Marshall, at Murray Hill in the northcentral part of the city." A portion of the armament of the work at Murray Hill has arrived and most of the traverse circle platforms have been laid," he could report on 6 November 1861, "and some of the chassis and carriages are in place, ready for guns . . . "[48]

By January 1862, the emergency defenses for the city of Baltimore were nearly all in place. Brewerton proudly related his achievements to General Totten: Forts Federal Hill and Marshall were both armed; both contained barracks, the former for 1,000 men, the latter for 400; traverse circle stones had been laid at three fronts at Fort Carroll.[49] The city seemed secure. Fortunately, the defenses would never have to be tested.

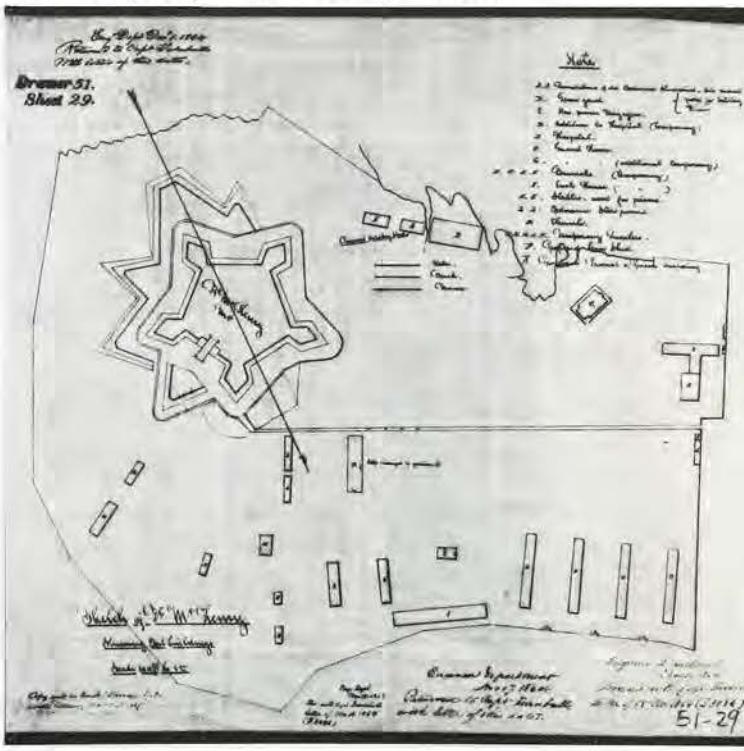
While combat never ventured near Baltimore during the war, the young manhood of the nation continued to bleed to death. As 1862 ended the war's most destructive campaigns of Gettysburg, Vicksburg, Chattanooga and Atlanta and the drive on Richmond still lay in the future. Meanwhile, Brewerton remained in Baltimore diligently performing the task of maintaining the fortifications of the area. He was especially vexed by the constant dampness of the magazine at Fort McHenry. This structure had never adequately served its purpose. Repairs always failed to solve the problem.

Brewerton proposed to build a new magazine with an air chamber or space between the outer and inner walls. He maintained that such an air space would prevent condensation in the inner magazine caused by the differences in temperature outside and inside. Although the magazines at Fort Federal Hill and Fort Marshall were entirely underground, they had three air chambers and were perfectly dry. "The lining of the magazine . . . [should] be constructed of boards, tongued and grooved together," he advised. "so as to exclude any air from the chamber . . "[50] Over the next year the army erected a large detached magazine at Fort McHenry, follow-



Military Map of Baltimore, 1862, showing Forts Carroll, McHenry, Federal Hill, and Marshall.—National Archives

Fort McHenry, November 1864. The reservation was used as a detention center for Confederate prisoners during the Civil War.



Baltimore District Engineer Lieutenant Colonel Brewerton supervised construction at Fort Marshall and Fort Federal Hill during 1861.—Library of Congress

Lithograph of Fort McHenry made by E. Sachse and Company of Baltimore in 1862.—Library of Congress

ing Brewerton's suggestion by incorporating a one-foot air chamber all around. It still stands isolated near the western boundary of the reservation.[51]

The magazines at Fort Carroll also leaked. Heavy rains during April 1864 inundated them, making their further usefulness questionable. "I fear that the powder and fixed ammunition now stored in them may be seriously injured," Brewerton notified Totten, "and therefore recommend that these be removed to a place of safety—say the new detached magazine at Fort McHenry, which is now in a readiness to receive powder "[52]

During the war little was really done toward completing Fort Carroll. Materials and labor were scarce. For example, Brewerton could not get any granite. "From the great scarcity of vessels, and consequent high rate of freights," he wrote, "the parties furnishing stones have found it impossible to supply us with the material . . . ."[53] Workers became increasingly hard to lure out to the construction site at the prevailing daily wage scales of $3.00 for bricklayers, machinists and master stone cutters, $1.30 for unskilled labor, and 90 cents for boys. Labor wanted a raise of at least 25 cents a day.[54]. Besides, the Board of Engineers in Washington was contemplating a major modification in the design of the fort itself, making continued construction under the original plans pointless and wasteful. Brewerton declared that "it will be prudent to stop construction, if it is at all likely that the proposed modificaton will be sanctioned."[55]

Near the end of his tour of duty in Baltimore, in October 1864, Brewerton succinctly summarized the reasons why little had been accomplished at Fort Carroll. He wrote:

> For the last three to four months our force at Fort Carroll has been small owing in part to the high price of labor, and consequent difficulty in procuring workmen at reasonable rates of wages—and also for want of definite information as to contemplated changes in the plan and profile of the work.[56]

By the end of the war Fort Carroll had cost $1.375 million.[57] It remained unfinished. There were no definite plans for further work.

The destruction of the Southern military and political resistance on the battlefield became a reality by the spring of 1865. The Confederacy was devastated. But the ability of military power to control men's minds and attitudes proved elusive.

Meanwhile, Lt. Col. Brewerton retired from Baltimore on 5 November 1864, having served the area well. Fort Carroll had been a constant frustration. However, he could take pride in the effort and in the efficiency with which he erected Forts Federal Hill and Marshall during 1861. He concluded his engineering career in supervising the digging of field works at Point Lookout, Maryland, through May 1865, and finally as a member of the Board of Engineers. He retired from active duty in 1867.[58]

VI

Capt. William P. Craighill became Baltimore District Engineer on 10 November 1865. He had been assistant engineer in Baltimore during 1863 and 1864. As District Engineer he would have a tremendous influence on the Baltimore area for the next several decades. His immediate concern was to dispose of all Engineer property around the city except Forts Marshall and Federal Hill, which were still occupied, and to make timber repairs at Fort Marshall.[59]

Militarily, he thought the first priority should go to completing Fort Carroll. "In its present condition," he reminded the Chief of Engineers, "little account should be taken of Fort Carroll as its principal face is nearly to the level of the water . . ."[60] An enemy fleet could pass it easily, engage Fort McHenry and burn the city at the same time. Craighill exhorted:

> Baltimore is one of our largest, richest and most important cities. It is on the direct road from the capital to the nation to the north. It may be deemed secure from its retire position near the head of the Chesapeake bay, but an enterprising European naval commander, suddenly appearing on the Atlantic coast with a large steam fleet at his disposal, might, I believe, pass the Capes unobserved, burn the city of Baltimore and regain the open sea before a fleet could be assembled to meet him, and even if a fleet met him in the Bay, Baltimore would have been burned. If Fort Carroll were completed . . . such an attack would not be practicable. I think the best way in which to complete Fort Carroll is to make it a casemated work of three tiers without barbette.[61]

Craighill was ignored. Fort Carroll was never completed. Constantly concerned with the defense of Baltimore, years later Craighill would repeat his plea for renewal of work on the fort.[62] But as the nation became industrialized and grew stronger, the threat of a seacoast attack seemed to diminish. The sense of urgency over erecting seacoast fortificationsaround Baltimore was gone. Advances in rifled artillery and naval gunnery made forts such as Carroll obsolete. Craighill himself, as District Engineer devoted most of his energy, not to fortifications, but to improving rivers and harbors and to alterations to the Baltimore harbor.

Footnotes to Chapter III

[1]Rpt, WD to A.R. 15th Cong., 2nd sess., 22 Dec. 1818. In *Amer St Papers; Mil Aff*, vol. I, doc. 169, pp. 810-13.

[2]Rpt, Board of Engrs, 16th Cong., 2nd sess., 7 Feb 1821. In *Amer At Papers; Mil Aff*, vol. II, doc. 206, p. 306.

[3]*Ibid.*

[4](1) Rpt on State of Military Establishment, 18th Cong., 1st sess., 2 Dec 1823. In *Amer St Papers; Mil Affairs*, vol. II, doc. 247, p. 567. (2) Annual Rpt, Col. Charles Gratiot, C of Engrs, 1 Nov 1834. Pt of Annual Rpt, Sec War, 23rd Cong., 2nd sess., 2 Dec 1834. In *Amer St Papers; Mil Aff*, vol. V, doc. 585, pp. 386-87. (3) Trouble with the foundation at Fort Calhoun persisted. In 1857 Chief of Engineers Totten reported that all work at Fort Calhoun had been leveled and was beginning anew. Annual Rpt, Gen. Joseph Totten, C of Engrs, 24 Nov, 1857, pp. 11-13.

[5]Resolution of Md Gen Assembly, 5 March 1832, to H.R., 22nd Cong., 1st sess., 13 Apr 1832. In *Amer St Papers; Mil Aff*, vol. V, doc. 526, p. 11.

[6]Rpt of Engr Dept, 22 Jan 1834. Pt of Rpt of House Comm. on Mil Aff, 23rd Cong., 1st sess., 4 March 1834. In *Amer St Papers; Mil Aff*, vol. V, doc. 567, p. 265.

[7]*Ibid.*, pp. 264-65

[8]Sec of War Lewis Cass, Rpt on Means and Measures Necessary for Military and Naval Defenses of the Country, 8 Apr 1836. In *Amer St Papers; Mil Aff*, vol. VI, doc. 671, p. 384.

[9]Annual Rpt of Sec War, 24th Cong., 2nd sess., 6 Dec 1836. In *Amer St Papers; Mil Aff*, vol. VI, doc. 699, p. 809.

[10]Thompson and Newcomb, "Historic Structure Rpt, Ft McHenry," p. 34.

[11]Nelson, "Architectural Study of Ft McHenry," pp. 39-40.

[12]*Ibid.*, pp. 78, 79, 81.

[13]*Ibid.*, pp. 40-42

[14]Thompson and Newcomb, "Historic Structure Rpt, Ft McHenry," pp. 43-47.

[15]Engr Dept, Rpt on Land Around Ft McHenry, 19th Cong, 1st sess, 17 Mar 1826. In *Amer St Papers; Mil Aff*, vol. III, doc. 322, p. 268.

[16](1) Communication from Sec War on Experience of Obtaining More Land for Ft McHenry, Near Baltimore, 23rd Cong., 2nd sess., 13 Dec 1831. In *Amer St Papers; Mil Aff*, vol. V, doc. 612, pp. 626-27. (2) Rpt of C of Engrs, 30 Nov 1837. Pt of Annual Rpt of Sec War, 25th Cong., 2nd sess., 5 Dec 1837. In *Amer State Papers; Mil Aff*, vol. VII, doc. 754, p. 632.

[17]Thompson and Newcomb, "Historic Structure Rpt, Ft McHenry," p. 53.

[18]*Ibid.*, p. 54.

[19]Maj William P. Craighill, Rpt for FY ending 30 Jun 1884. Recs of C of Engrs, Nat Archives, Rec Gp 77, entry 977, vol. IV. A *casemate* is a shellproof or armored enclosure pierced for guns, as in the wall of a fort or on a warship. A *barbette* is a platform for guns in a fort, high enough to allow them to fire over the walls.

[20]Ltr, Ogden to Totten, 17 Oct 1848. Rec Gp 77, entry 968, vol. I.

[21]For complete details on the life of Robert E. Lee, see the definitive biography by Douglas Southall Freeman, *R. E. Lee* (New York: Charles Scribner's Sons, 1935), 4 vols.

[22]*Ibid.*, vol. I, p. 305.

[23]Ltr, Lee to Totten, 1 Oct 1849. Rec Gp 77, entry 968, vol. I.

[24]Freeman, *R. E. Lee*, p. 306.

[25](1) *Ibid.*, pp. 308-309. (2) Ltr Lee to Totten, 5 Nov 1850. Rec Gp 77, entry 968, vol. I. (3) Annual Rpt, Gen. Joseph Totten, C of Engrs, 14 Nov 1850, p. 10.

[26]Ltr, Lee to Totten, 1 Oct 1851. Rec Gp 77, entry 968, vol. I. The difficulties caused by building a heavy fort on an artificial or soft island were not peculiar to Baltimore. There were similar troubles with Fort Delaware on the Pea Patch in the Delaware River, and with Fort Calhoun on Rip Rap Shoals in the Virginia area of Chesapeake Bay.

[27]Freeman, *R. E. Lee*, p. 318.

[28]Robert De Gast, *The Lighthouses of the Chesapeake* (Baltimore: Johns Hopkins Press, 1973), p. 95.

[29]Ltr, Brewerton to Totten, 10 Oct 1853. Rec Gp 77, entry 968, vol. I.

[30](1) Ltr, Brewerton to Capt. Edmund L. F. Hardcastle, Engr Sec of Light House Board, 24 Dec 1853. Rec Gp 77, entry 968, vol. I. (2) De Gast, *Lighthouses of the Chesapeake*, p. 95.

[31]Ltr, Brewerton to Totten, 12 Jan 1855. Rec Gp 77, entry 968, vol. I.

[32]*Ibid.*, 24 Jan 1855.

[33]*Ibid.*, 15 March 1856.

[34]*Ibid.*, 19 May 1855.

[35]*Ibid.*, 10 Oct 1855.

[36](1) *Ibid.*, 6 May and 16 Oct 1857. Rec Gp 77, entry 968, vol. II. (2) Annual Rpt, Gen. Joseph Totten, C of Engrs, 24 Nov 1857, pp. 175-76.

[37](1) Annual Rpt Gen. Joseph Totten, C of Engrs, 22 Nov 1858, p. 11. (2) Ltr, Brewerton to Col Sylvanus Thayer, 17 Aug 1858. Rec Gp 77, entry 968, vol. II.

[38]Ltr, Lt Cyrus B. Comstock to Lt Col Rene E. De Russy, 7 Jul 1859. Rec Gp 77, entry 968, vol III.

[39]Ltr, Comstock to M. B. Howard, Board Master, Ft Carroll, 20 Jul 1859. Rec Gp 77, entry 968, vol. III.

[40]Ltr, Capt John G. Foster to De Russy, 7 Nov 1859. Rec Gp 77, entry 968, vol III.

[41]*Ibid.*, 24 Aug 1860.

[42](1) Beirne, *Baltimore: A Picture History*, pp. 35-36. (2) Whedbee, *Port of Baltimore*, pp. 72-81.

[43]Annual Rpt, Gen. Joseph Totten, C of Engrs, 22 Nov 1858, p. 11.

[44]Ltr, Brewerton to Totten, 15 Apr 1856. Rec Gp 77, entry 968, vol. I.

[45]George J. Svejda, *Historic Structures Report: Fort McHenry National Monument and Historic Shrine* (Div of Hist, Off Archeology and Hist Preservation, Nat Park Serv, Dept of Interior, 30 June 1969), pp. 55-56.

[46]Ltrs, Brewerton to Totten, 29 Apr and 8 May 1861. Rec Gp 77, entry 968, vol. II.

[47]*Ibid.*, 7 Sep 1861.

[48]*Ibid.*, 6 Nov 1861.

[49]*Ibid.*, 16 Jan 1862.

[50]*Ibid.*, 18 Feb 1863.

[51]Thompson and Newcomb, "Historic Structure Rpt, Ft McHenry," p. 60.

[52]Ltr, Brewerton to Totten, 13 Apr 1864. Rec Gp 77, entry 968, vol. III.

[53]*Ibid.*, 12 Apr 1863, vol. II.

[54]Ltrs, Brewerton to Brig Gen Richard Delafield, C of Engrs, 20 Jul and 17 Oct 1864. Rec Gp 77, entry 968, vol. III.

[55]Ltr, Brewerton to Totten, 31 Mar 1864. Rec Gp 77, entry 968, vol. III.

[56]Ltr, Brewerton to Delafield, 17 Oct 1864. Rec Gp 77, entry 968, vol. III.

[57]Index to Annual Rpts, C of Engrs, on Fortifications, vol. II, p. 1804.

[58]George W. Cullum, *Biographical Register of the Officers and Graduates of the U.S. Military Academy at West Point, N.Y., 1802-67.* (New York: D. Van Nostrand & Co., 1868), vol. I, p. 185.

[59]Ltrs, Craighill to Delafield, 20 and 30 Dec 1865. Rec Gp 77, entry 968, vol. III.

[60]*Ibid.*, 18 Jan 1866.

[61]*Ibid.*

[62]See Craighill, Rpt for FY ending 30 Jun 1884. Rec Gp 77, entry 977, vol. IV.

Chapter IV
A Monument to an Engineer's Skill: William P. Craighill and the Baltimore Harbor

Of all the contributions that the Baltimore District of the Army Corps of Engineers made to the Baltimore metropolitan area, the excavation of the Baltimore harbor stands as its foremost achievement. The widening and deepening of the water approaches to the city and the creation of new channels propelled Baltimore into becoming the second largest Atlantic port to New York City. The water highway connected the Atlantic coast and the Midwest to Europe and South America at a time when water transportation was the most efficient and least expensive means of hauling manufactured commodities and raw materials.

Baltimore has ideal geographical advantages. Most important, it is the westernmost of all Atlantic ports; yet it is on the Patapsco River only ten miles from Chesapeake Bay and 150 nautical miles from the Virginia Capes, the entrance to the Atlantic Ocean. As the Baltimore and Ohio Railroad surged westward, the tie between the port and the interior solidified. The tonnage of traffic moving to and from the Midwest through the harbor spiraled upward. More American and foreign ships visited the Patapsco shores annually.

The swift clipper ship dominated trade until the Civil War, and Baltimore led in the construction of these sailing vessels. But by mid-century, the desire for larger cargo capacity meant that the clipper ships could not survive. Large steam-powered craft soon dominated sea traffic. Naturally, as the size of ocean vessels grew, enlargement of the Patapsco River's approaches to the city became imperative.

II

Even before the advent of steam ocean cruisers, Baltimoreans had an abiding concern in maintaining the water avenues to their city. After the American Revolution, the mayor appointed a Board of Port Wardens to control harbor traffic and to keep navigation channels open. The Board built its own primitive dredge. From 1798 on, the city spent money dredging its inner harbor.[1]

Outer-harbor improvement depended on the federal government. As early as 1826, the Secretary of the Navy reported to Congress on a survey of the harbor. The depth of the main channel at mean low water measured seventeen feet. The Secretary noted that, "the water can be readily, and at inconsiderable expense, deepened to 20 feet, by means of the admirable mud-excavators now in operation in the harbor."[2]

In 1830 the Army Engineers surveyed the harbor and in 1836 Congress appropriated $20,000 for deepening the entrance channels. The law stipulated no specific dimensions. Congress placed the money in the hands of the Board of Port Wardens, and to effect the improvements the Board used it to hire the dredging apparatus belonging to the city.[3] By

1838 an additional $35,000 of federal money had been spent on dredging the Patapsco. The Engineer Department requested that Congress appropriate $25,000 annually for the harbor's maintenance. But after 1838 river-and-harbor improvements encountered vociferous political and constitutional criticism. Baltimore harbor received no more federal funds until 1852.[4]

III

When Cap. Henry Brewerton became Baltimore District Engineer in 1852, his appointment coincided with a reawakened Congressional generosity in allotting funds for internal improvements. Hence, new federal money became available for the Baltimore harbor project. Besides overseeing the construction of Fort Carroll in the Patapsco River, the excavation of the harbor became Brewerton's main responsibility.

Born in New York City at the dawn of the nineteenth century, Brewerton entered West Point at the age of twelve and after graduating served in the Corps of Engineers for forty-eight years until he retired in 1867. Before coming to Baltimore he had already earned an outstanding reputation from his work in charge of navigation and defenses in the Mississippi delta and at Charleston harbor in South Carolina. At both places he contracted illnesses which sapped his energy for the rest of his life. Nevertheless, he vigorously pursued all his remaining duties as superintendent of the Military Academy and as Baltimore District Engineer.

Brewerton's first task upon arriving in Baltimore was to examine various types of dredging machines and to select the most efficient model for use in the Patapsco. He envisioned that three dredges would be necessary to excavate the Patapsco to a depth of twenty-two feet. He finally settled on a single-bucket dredge which worked two cranes and two scoops at the same time. Such a machine could excavate around 100 cubic yards of mud an hour. Of course, steamboats would be needed to tow dumpers into shallow water where the spoil was to be deposited.[5] At first both the city and the Army Engineers contracted for constructing their own single-dipper dredge. The city was vitally interested in improving its harbor, particularly after completion of a railroad network leading to the port. As Brewerton noted, "it is intended that the steam-dredge recently constructed for the water of the Chesapeake Bay and Atlantic Coast, shall for the present cooperate with the new steam-dredge belonging to the City of Baltimore . . . " The city also agreed to use its steam tug to tow the government's dredge. Since they would be working so closely together, Brewerton appointed the city dredging superintendent to serve in that capacity for the Engineers.[6] By November 1853, both dredges, having been tested and paid for, were working in the Patapsco River.[7]

The area to be improved was divided into two sections. The upper branch started at Fort McHenry and extended six miles down river to a point one and a half miles below Fort Carroll. Average natural depth of this branch ranged from nineteen to twenty-one feet. The lower division ran nine miles from the point one and a half miles below Fort Carroll to four miles beyond North Point. Average depth here was only sixteen to eighteen feet.[8]

Brewerton concentrated his efforts entirely on this lower branch. He surveyed the route and marked out the most suitable course for the proposed excavation. He had buoys placed about every half mile; red on the eastern side, white on the western. The goal was to form a channel 150 feet wide and twenty-two feet deep.[9]

Dredging, which began on the lower branch in the fall of 1853, continued until the Civil War. Gradually the channel took shape. At first the city and the United States each employed one dredge, but in July 1854 the city added a third dredge to the fleet. In 1857 the federal government contributed two more dredges and a tug to the project. By the end of

Steamboat of the Baltimore, Norfolk, and Portsmouth Bay Line, n.d.—Library of Congress

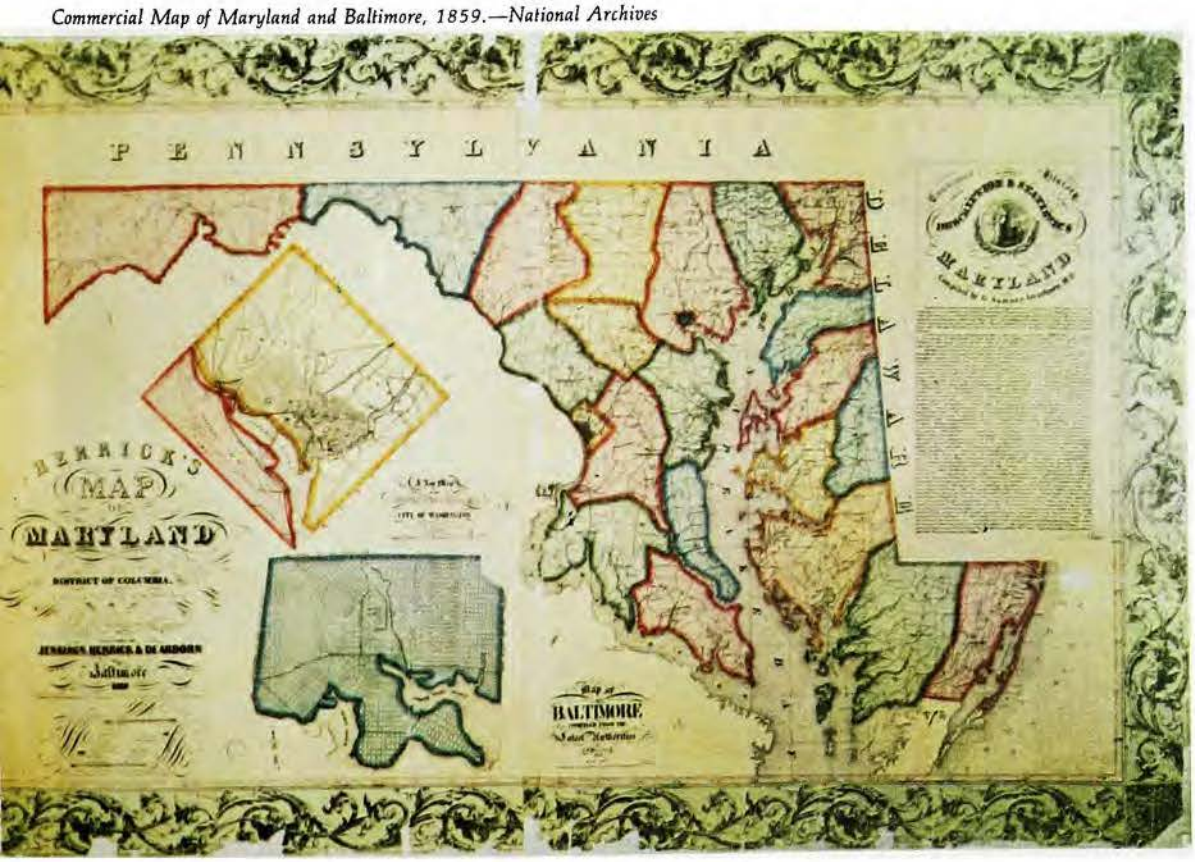
1858 the channel could support vessels that drew about twenty feet.

On 7 August 1858, the *Empress of the Seas*, the largest ship ever to enter the port of Baltimore up to that time, arrived through the new channel, drawing nineteen and a half feet. Chief of Engineers Joseph Totten proudly announced that the "vessel could no doubt, have carried through the new channel with a draught of 21 feet, as there were no indications that the ship's keel was near the bottom."[10] Brewerton urged that the channel be completed as soon as possible so that it could accommodate the largest class of vessels desiring to visit the port. He wanted $100,000 for the channel for the next fiscal year.[11]

No new money was forthcoming. Operations on the Patapsco River had to be suspended. They did not resume again until 1866. Although the engineers regretted the abrupt termination of the project, they could be proud of what had been accomplished. A survey in November 1859 showed that six miles of the channel had been dredged to an average depth of twenty-three and a half feet. To demonstrate their gratitude for the government aid they had received, the city's Board of Commissioners named the channel in honor of Army Engineer Henry Brewerton, whose tireless energy had made the excavation a success.[12] The digging of the Brewerton Channel was not only a personal triumph for Brewerton; it was testimony to what could be achieved in a true cooperative effort between local city officials and the federal government. The two jurisdictions worked side by side with no apparent friction. They assisted each other at every turn by mutual use of workmen and equipment. This collaboration was all the more impressive because it occurred at a time when the federal system was on the verge of blowing apart.[13]

The Brewerton Channel, however, was not complete. Three miles remained to be dredged. And already the city's businessmen and the Army Engineers were urging that the

Commercial Map of Maryland and Baltimore, 1859.—National Archives



William P. Craighill—National Archives

excavation be carried on until the whole length of the channel was cut to a depth of twenty-five feet. Such a depth was mandatory to accommodate the new large coal shippers. A twenty-five foot channel would benefit the federal government, one Army Engineer observed, because it would "open to the U.S. steamers a cheap and excellent coal market . . . without the extra cost of freight."[14] But further development of the Baltimore harbor had to wait until after the Civil War. During the military emergency the army engaged most of the Corps officers in the field. Internal improvements ceased. The Army Engineers loaned the dredges to the Quartermaster and Navy Departments for military purposes.[15]

IV

When work resumed on the Baltimore harbor in 1866 the first order of business was to measure the Brewerton Channel to ascertain how well its depth had been maintained and what further dredging would be required.[16] Maj. William P. Craighill was now the District Engineer. He would dominate District affairs until the late nineteenth century.

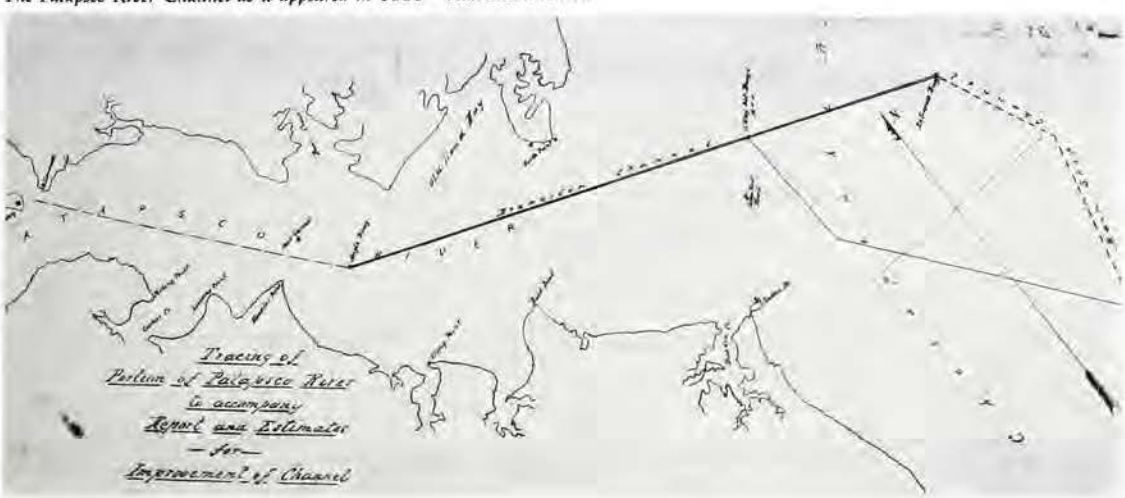
Craighill was one of the true intellectuals of the Corps of Engineers. He was equally at home in reading history as in performing his technical tasks as an engineer. Throughout his life he surrounded himself with books which he read avidly. "His love of home, books and family kept him apart from club life," the Baltimore *Sun* observed on his death on 18 January 1909, "and his chief hobby was his work—military engineering."[17]

Born in Charles Town, Jefferson County, in what is now West Virginia on 1 July 1833, Craighill was one of the many Southerners of his generation who distinguished themselves in military service. He entered the Military Academy in 1849 at the age of sixteen and graduated four years later as the youngest member of his class and ranking second in academic achievement. His service before the Civil War, was extensive and varied, encompassing tours of duty on the Savannah River, Georgia; Charleston harbor, South Carolina; Fort Jefferson, Tortugas, Florida; and Fort Delaware in Delaware Bay. He also served as Assistant to the Chief of Engineers in Washington, D.C. and as Assistant Professor of Engineering at West Point.

His literary and linguistic talents became evident during the Civil War when he compiled the *Army Officers' Pocket Companion* in 1861 designed principally for staff officers in the field. He also translated two French works on military theory: Guillaume Henri Dufour's *Strategy and Tactics* and Henri Jomini's *The Art of War*.

The Civil War deeply troubled Craighill. He did not want to fight against his Southern friends, but at the same time he ardently opposed secession. He agonized deeply over the divisions within the country; but ultimately, under the influence of fellow Virginian Winfield Scott, he stuck by the Union. He

The Patapsco River Channel as it appeared in 1866—National Archives



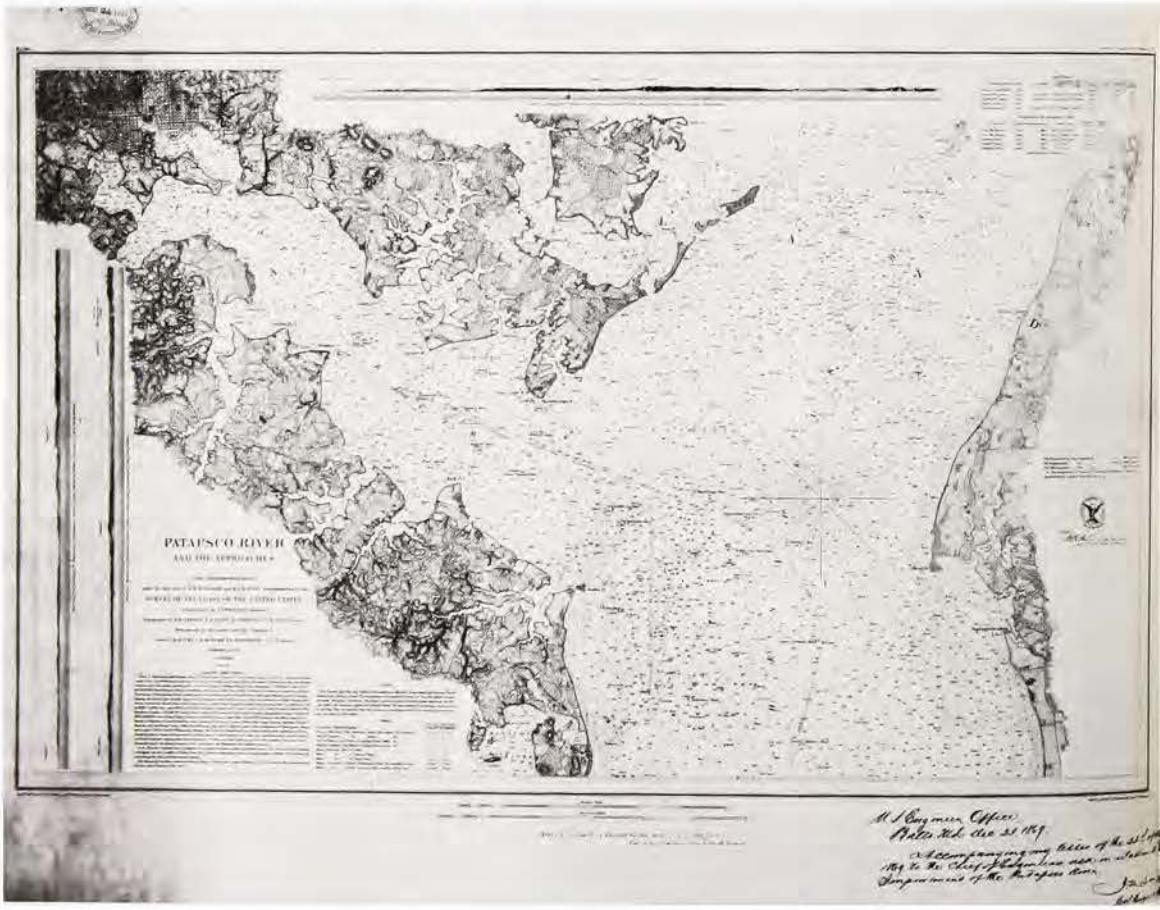
became engaged in constructing defenses at Cumberland Gap, Tennessee and Pittsburgh, Pennsylvania. During 1863 and 1864 was assistant to Brewerton at Baltimore harbor.

Despite remaining a strong advocate of military preparedness throughout his entire career, his wartime experience brought out his hatred for war and the realization that in battle usually innocent victims such as women and children bore the brunt of the suffering. He blamed the conflict on "a few miserable corrupt accursed politicians, who tricked the honest people of the South into retaining their insane folly by practicing the most erroneous deceptions that were ever attempted with any people." Because of this deception, he asked in a letter to his West Point classmate and friend James B. McPherson, who was killed at Atlanta by a Confederate bullet in July 1864, "how many innocent men, women and helpless children must suffer; how many indeed have already suffered? This is one of the mysterious orderings of Providence in the management of the affairs of the world that I cannot understand."[18]

When Craighill became Baltimore District Engineer on 10 November 1865 he still had most of his career ahead of him. He would spend the better part of the next quarter of a century in Baltimore. No other person did more to shape the city's harbor.

After consulting with Brewerton in the spring of 1866 as to previous dredging accomplished on the Patapsco River, Craighill immediately set about the task of surveying the Brewerton Channel to determine its present navigable condition.[19] What he discovered proved alarming. The lower portion of the Brewerton Channel below North Point had shoaled considerably due to the conflicting currents from the Susquehan-

The Patapsco River approach channels, 1869.—National Archives



na and Patapsco Rivers and Chesapeake Bay. "It is my belief," Craighill lamented, "that the straight cut below Fort Carroll will in time fill up to a certain extent if left entirely to the action of natural causes . . ."[20]

To remedy the situation, Craighill proposed a new cut be constructed to alter the direction of the channel. Instead of going straight out into the bay, the channel would run due south for about three miles and then turn off in a southeasterly direction. This course would correspond to the currents of the Patapsco and Susquehanna Rivers. The principal obstructions in the intended modification of the route were lumps that dredging could eradicate.[21]

The Engineer Department approved Craighill's plan and three dredges with their complement of scows and one tug began to cut the new water passageway. While Craighill himself was serving as Assistant to the Chief of Engineers in Washington from 19 October 1866 until 31 March 1870, Brevet Maj. Gen. John G. Parke and Col. John H. Simpson supervised digging the new cut. The goal was for a channel 200 feet wide and twenty-two feet deep. It was Simpson who designated the highway the Craighill Channel. When he learned that he was to be immortalized in such a way, Craighill professed embarrassment.[22]

By the summer of 1869 the Craighill Channel was almost ready for commercial traffic. In August, Simpson ordered a final sounding, to mark with buoys any lumps that might have been missed "so that the dredges may remove the lumps with certainty."[23] An innovative method employed for searching the bottom was successful. Boatmen attached two poles to each side of a tug; each pole was marked to twenty-two feet and had an iron shoe at the bottom. Several tugs, with poles thus affixed, traveled slowly up and down the river. Using this arrangement, Simpson reported, "the channel was quite thoroughly swept, and every lump or knoll . . indicated by the rising of the pole, and the exact depth shown on the pole to which the channel at those points should still be dredged."[24] The lumps were so effectively eliminated that in October Simpson opened the channel to vessels that drew fewer than twenty-one feet. The new water artery, he proclaimed, "will very materially benefit the commerce of the harbor in shortening the distance about 3½ miles to the city and enabling vessels of greater draft to approach nearer to it."[25] Not only would the new channel save distance and not shoal; it would avoid the hazard caused by accumulation of ice during the winter in the lower part of the old Brewerton Channel.[26]

In the short run, the Craighill Channel failed to fulfill expectations. It was not wide enough. Large steamships and sailing vessels seldom ventured into the waterway for fear of grounding on the oyster beds that bordered it on each side. To transform the channel into a perfectly safe and desirable course for large ships, Simpson declared, it should be widened to 500 feet.[27]

V

The most vexing problem facing Simpson during his term in Baltimore concerned a dispute over his firing of John Lloyd, civilian superintendent of dredges. Simpson discharged on 12 August 1869 for alleged inability to perform his duties and for insubordination; Lloyd had hired a man to operate one of the dredges against Simpson's direct order.[28] Lloyd did not take his dismissal lightly. He accused Simpson of political favoritism and even went so far as to intimate that Simpson employed a conscious policy of firing Union men and replacing them with former Confederates. This sent the Baltimore District Engineer into a rage. He termed Lloyd so incompetent, vain, arrogant and ignorant "as to bring the whole business of dredging the channel of the Patapsco river into disrepute . . ."[29] Mr. N.H. Hutton, former assistant United States engineer, who in the 1880's became embroiled in a controversy with dredging companies over his close supervision of contracts, came to Simpson's defense. To Hutton, there was absolutely no basis to the charge that Col. Simpson discriminated against Mr. Lloyd for political reasons. He had fired Lloyd for being incompetent. Furthermore, his replacement, a Mr. D.C. Ronsaville, was a well-known Union man and a Republican. Finally Lloyd's wild assertion that on the day of the 1868 Presidential election Simpson arranged for a government tug to bring men to town to vote for the Democratic candidate Horatio Seymour, while known advocates of Republican Ulysses S. Grant were forced to hire a boat for themselves, was a lie. Hutton, who was

Simpson's assistant engineer at the time, claimed to be "cognizant of the details of all such matters and I can most positively affirm that the [statement] of Mr. Lloyd is not true."[30]

The appointment of the superintendent of dredging, however, was based on political favoritism, but Col. Simpson had nothing to do with it. It was a patronage job which the United States Postmaster General awarded. In the summer of 1870, Postmaster General John A. Creswell, acting through the War Department, replaced Ronsaville, who had been Simpson's choice, with a Mr. John M. Dempsey. Simpson was chagrined. He would carry out orders and employ Dempsey, he wrote the Postmaster General, "but I feel it to be my duty as your friend to say that by doing so, a very respectable, honest and capable citizen, Mr. D. Ronsaville, a Republican, will be sacrificed whose integrity and experience can ill be spared at this time."[31] Craighill also lauded Ronsaville for having "served long and faithfully in the Engineer department and with great acceptability to every officer having charge of the work upon which he has been engaged."[32] Simpson was frustrated. He complained that his orders were being constantly disregarded and he despairingly wrote his superior that "I feel like an officer, who, while the government imposes on him all the responsibility of the disbursements and efficient working of his department, yet has in a manner subjected him to an employe who will bring certain ruin to the government operations with which he has been entrusted . "[33] Finally, Simpson's pleading succeeded. By mid-October, two weeks before Craighill's return, Dempsey had been replaced.[34]

VI

By 1870, the Baltimore harbor compared favorably with those of all other Atlantic ports. United States dredges had toiled in the Brewerton Channel off and on for about fifteen years and in the Craighill Channel for five or six with no serious accidents. But the equipment was old and worn and required frequent and costly repairs. The army did not want to have to funnel all future appropriations into equipment maintenance. Therefore, during the winter of 1871-72 it sold all its dredges and scows and decided to prosecute future work primarily by contract.[35]

Craighill was particularly pleased with the results. Using the $50,000 appropriated in March 1871, he let two contracts with New York dredging companies for removing 310,000 cubic yards of material from the Brewerton Channel. Craighill happily noted that the companies executed the contracts "with a marked increase in rapidity of execution and an equally marked decrease in cost."[36] In short, the government received more dredging for its money.

As the harbor improved, the number of ships using the port grew. In 1870, 735 foreign vessels entered the harbor, compared with 650 in 1869. During the first half of 1871 the total reached 508 ships.[37] The city of Baltimore prospered. And the dredging performed in the harbor's channels under the direction of the U.S. Army Corps of Engineers was significantly responsible for stimulating this prosperity.

Baltimore's leaders wanted their port to continue growing. The expansion in the port's commerce since the Civil War, especially by foreign vessels, only intensified the

Baltimore and Ohio Railroad Pier, Locust Point, ca. 1875.

pressure for more rapid progress in dredging operations. The Baltimore City Council, the Board of Trade and the Corn and Flour Exchange all urged Craighill to push for a deeper approach channel. Currently, ships drawing more than twenty-feet ran grave risks of grounding if they dared venture into the port. The Corn and Flour Exchange went so far as to ask the city to appropriate massive funds for improving the harbor to a depth of twenty-four feet without waiting for the United States Congress.[38] Baltimore's Mayor Joshua Vansant agreed that the "matter of sea navigation is too important to all the great producing and commercial interests of Baltimore to be allowed to depend on the contingency of national aid." He therefore requested the city council to vote liberal appropriations for the harbor's expansion.[39]

The Baltimore *Sun* joined the chorus of those who sought more money for dredging the Patapsco River approaches to the inner port. To the *Sun*, a federal appropriation of at least $300,000 would be reasonable. "Our representatives in Congress should direct their earnest and united efforts," the paper exhorted, "to secure, at the earliest possible day, such an appropriation."[40] A later editorial stressed that since Baltimore is 200 miles nearer to St. Louis than is New York, and relatively closer to other important Western points, Congressmen from the vast grain-producing regions of the West should also lobby for a generous federal grant for Baltimore's port.[41] The Collector of the Port of Baltimore agreed. He wrote Craighill that "the affinities of trade subsisting between Baltimore and throughout the country, and especially the West, make . . . improvement of national as well as local concern."[42]

The campaign for a large infusion of funds into Baltimore's harbor improvement paid off handsomely in 1872. During that year the city organized a Board of Improvement and provided it with $200,000 for immediate expenditure on the harbor, and Congress

Currier and Ives drawing of Baltimore Harbor, 1880.—Library of Congress

appropriated $100,000 for the project. Craighill would supervise the concurrent federal and municipal operations.[43]

During the spring of 1872 Craighill revised the entire project. Now it would be possible to widen and deepen the harbor approaches on a massive scale. The goal expanded to providing a channel twenty-four feet deep throughout. The deeper waterways were mandatory in order to accommodate the growing size of ocean-going cargo steamships. Besides, the channel would be widened to 250 feet from Fort McHenry through the Brewerton Channel, and to 400 feet through the oyster beds and hard lumps of the lower Craighill Channel.

By the summer of 1872 the army and the city had thirteen dredges, three of them being the new clam-shell type, employed in the harbor, forming at that time the largest force of dredges ever used on the same project. The clamshells excavated three times as quickly as the old dipper model. The common dipper had a single bucket with a scoop attached to a long boom. The clamshell's two jaws or shells could open and shut and dig more effectively than the dipper's scoop. Most of the force scraped the bottom on the northern side of the Brewerton Channel, widening the approach 100 additional feet over a distance of six and three-quarter miles. Three dredges worked on the lower portion of the Craighill Channel. Widening of the Brewerton Channel was complete by the end of 1872. Craighill exulted over the superiority of the digging by the clamshell dredges particularly during the winter months. The volume of material excavated during December 1872, he noted, exceeded any December to date and compared favorably with the averages of the more genial months. "This I think shows the superiority for this particular work of the 'clam shell' type of 'Dredge'," he wrote the chairman of the Patapsco River Improvement Board, "as it would have been almost impossible for the 'Dipper' type to have worked during December in the Brewerton Channel."[44]

During 1873 Craighill had $400,000 to spend on dredging the harbor, with the city and the federal government contributing equal shares. He let contracts for removing more than 2 million cubic yard of material, most of which was done during the year. During the entire operation dredging progressed swiftly with no serious setbacks. The only mishap reported occurred on the night of 14 April 1873, when a small steamer, failing to slow down, brushed a dredge and carried away quarter lines.[45] The city-contracted dredges worked in the Brewerton Channel while those under the government contract excavated in the Craighill Channel and in the region between Fort McHenry and Fort Carroll.[46] Because of this successful cooperation, by the end of 1874 Craighill could report that he had completed the entire channel to a depth of twenty-four feet. Now the world's largest ships could ply the waters of the Patapsco without fear of grounding. The width was 250 feet as projected, and 400 feet in the lower Craighill Channel. At the turn from the Brewerton Channel to the Craighill Channel, an angle of ninety degrees, the width was 1,000 feet to facilitate easy turns by larger vessels. Although Craighill was pleased, he emphasized that he regarded the present width of the entire channel as the minimum that could be accepted. He noted that "the sides are likely to be occasionally struck by large vessels, especially steamers, whose lengths are greater than the width of the channel . . ."[47]

Again, Craighill praised the clamshell. He estimated that without it the same excavation would have taken five to eight years. Statistics graphically supported his assertion. From April 1873 to April 1874 each of seven clamshells averaged 900 cubic yards of mud removed per day. The old dippers averaged only 250 yards daily. This advanced proficiency also slashed the cost of dredging from thirty-seven cents per cubic yard in 1871 to twenty-two cents in 1873.[48]

The opening of the twenty-four foot deep ship channel required suitable celebration. Therefore, the Patapsco River Improvement Board invited sixty of Baltimore's most prominent citizens for a twenty-mile excursion down the river on 2 July 1874, to examine the just completed artery. The Baltimore *Sun* described the event as "one of the most important to the present and future of Baltimore occurring in many years . . ." Speakers congratulated those responsible for the successful dredging, and Mayor Joshua Vansant, referring to Colonel Craighill's part in the work, said that "he had labored most assiduously and systematically and economically."[49]

The assurance of passable channels to the port of Baltimore had required the patient and persistent labor of many people, including city and federal officials, over the years. Certainly Henry Brewerton, John Simpson and William P. Craighill all deserved credit. In 1874, Craighill thought it was important to also underline the contribution by the city's chief engineer, N.H. Hutton, who had formerly served in the Corps of Engineers. Baltimore owed more to Mr. Hutton for the improved harbor, Craighill declared, than to any other person. "I feel under great personal obligation to him, while assisting me in the performance of my duty," Craighill wrote, "for the exhibition of much energy, patience, and skill by him. .He has had the immediate charge of the operations."[50]

Although compliments were in order, they meant nothing unless the work was maintained and improved. "It is not to be forgotten," Craighill reminded the Baltimore city fathers, "that this channel is an artificial road or highway. . It did not exist by nature. It was made, and to be kept in good condition it requires care in its use and annual repairs."[51]

VII

Not everyone approved the dredging of the Patapsco River leading to Baltimore. Some questioned whether "improvement" was really the proper word to describe excavating the approach channels from Chesapeake Bay. In a letter to the Chief of Engineers in 1872 Craighill noted that a few people were hostile to dredging in the Patapsco because they feared it would "diminish their pecuniary receipts."[52] He did not refer to particular groups or interests, but it is probable, from future protests and conflicts, that he meant oyster fisherman (or "watermen," as they are called in the Chesapeake Bay area). They were particularly upset because the dredging had destroyed the oyster beds in the Craighill Channel. In addition, it was illegal to trawl for oysters that remained in the newly buoyed and lighted waterway. Much to Craighill's chagrin, watermen constantly violated this state statute. He hoped the state would enforce the law strictly, he wrote in 1876, in order to prevent oystermen from injuring the channel. He acknowledged, however, that "it is very difficult to obtain such evidence as would convict the violation."[53]

For the business community as a whole the channel improvement was a tremendous benefit. What had once been a narrow zigzag 17-feet deep channel to the port was now straighter, wider and deeper. This resulted in expanding the volume of commerce which made Baltimore one of the main gateways to the Atlantic. The number of vessels drawing more than eighteen feet that used the port jumped from thirty-nine in 1872 to fifty-seven in 1875.[54] In a letter to Craighill the vice president of the Baltimore and Ohio Railroad expressed satisfaction over the port's growing commerce. He predicted a higher volume in the future when "it becomes widely understood that vessels of heavy draft can pass freely through the improved channel."[55] Despite a decline in imports in 1877 because of that year's economic depression, exports from the port of Baltimore continued to grow. At the close of the fiscal year ending 30 June 1871, the value of domestic foreign exports was more than $15 million. By the end of fiscal year 1876, exports amounted to more than $31 million and for fiscal year 1877 they totaled $40 million. The aggregate tonnage entering and departing the harbor rose by 1,322,586 tons from fiscal year 1876 to fiscal year 1877.[56]

The additional volume of trade led to the expansion of manufacturing and port facilities in Baltimore. For example, the growth of the export trade stimulated the opening of several textile mills around the city.[57] Besides cotton products, other chief commodities exported included grain, flour, petroleum, tobacco, livestock and canned goods.[58]

The Baltimore and Ohio and the Northern Central Railroads built huge wharves, docks, grain elevators and storehouses at the port to handle the burgeoning commerce. Construction of a drydock in 1879 on part of the Fort McHenry reservation that adjoined Baltimore and Ohio Railroad property at Locust Point was intended to accommodate large steamships in need of repairs. It was anticipated that this drydock would further encourage large cruisers to venture into the port.[59]

VIII

Between 1874 and 1881 there were no dramatic changes in the Patapsco channels. Federal appropriations, usually amounting to $75,000 annually, went to maintenance, so

little money remained for new work. In 1876 Craighill did supervise enlargement of the turning space at the junction of the Brewerton and Fort McHenry channels near Fort Carroll. At the same time, he contracted for widening the Craighill Channel to 330 feet at those places where it was narrower, and for enlarging the Brewerton Channel to 300 feet wide throughout.[60]

During this entire period Craighill kept exhorting for more federal money to facilitate Baltimore's port development. In his position in charge of dredging Baltimore harbor he acted not merely as a conduit carrying out the wishes of Congress through the War Department. He did not steer clear of politics, but instead assumed the role of an advocate who tried to increase the federal commitment to improve Baltimore harbor. He expressed his opinions forcefully to the Chief of Engineers and publicly and privately to the leading citizens of Baltimore. His constant theme was the need for more money for further channel excavation.

Map showing two proposed routes for Delaware and Chesapeake Ship Canal.—National Archives

In his 1876 report to the Chief of Engineers, Craighill decried the inadequacy of the channel's current width. "Any increase of width," he declared, "would be an improvement."[61] The channel could be maintained in its existing condition for $50,000 a year, he estimated, but due to the imperative need for a wider channel, he recommended an appropriation of $210,000.[62] The next year he repeated his plea, warning that large steamers using the port "are very apt to run against the sides of the channel, cutting off large slices of the bank, thus endangering the vessels and at the same time seriously injuring the channel."[63] To Craighill improvement of the Patapsco water highway should not be postponed. "It is of great importance," he wrote the Chief of Engineers, Brig. Gen. Andrew A. Humphreys, "to the navigation and other interests connected with the business of the city of Baltimore . . ."[64]

In his efforts to obtain federal funds to develop Baltimore's harbor, Craighill was supported by the city's business institutions, particularly those that depended on the export-import trade. The vice president of the Baltimore and Ohio Railroad characterized the harbor as the "front door" of his company. He estimated that 87½ percent of his company's business derived directly or indirectly from commerce flowing to and from Baltimore's shores. "The success of our Road, financially and otherwise," he admitted to Craighill, "depends so largely upon the success we may achieve in building up a large foreign business, that the question of Harbor facilities becomes one of prime importance."[65] The Chesapeake and Ohio Canal Company, desperate for business, saw the improvement of Baltimore harbor as a possible means to its own salvation whereby millions of tons of Cumberland coal arriving by the canal could be shipped to northern factories.[66]

Working behind the scenes, in 1880 Craighill wrote John W. Garrett, president of the Baltimore and Ohio Railroad suggesting a plan to quickly wrench money from Congress for the expansion of the Baltimore harbor. There was no facade of neutrality. Craighill, a Corps District Engineer, instructed a private citizen in how to obtain higher appropriations from Congress. He told Garrett that the cost

of dredging the channel twenty-seven feet deep would be $1.5 million. Congress had not asked Craighill to prepare such an estimate for Baltimore's harbor, but if that body instructed him to do so, that was the figure he would provide. "I would suggest therefore," he wrote Garrett, "that one of the Maryland delegation, either in the Senate or House . . be induced to introduce a resolution . . requesting or directing the Secretary of War to call upon the Chief of Engineers of the Army for an estimate of the cost of giving an increased depth of water to the city of Baltimore . . ." He concluded: "I can be ready to report at once when the resolution of Congress reaches me, and it would be possible to have action in Congress at the present session." Craighill instructed Garrett to keep the letter confidential.[67]

Later during that same year, Craighill wrote the Baltimore *Sun* proclaiming that the great grain elevators, wharves and the new dry dock all could be attributed to the excavation of the channel approach to the city. "The diversion of grain of the west down the Mississippi river since the improvement at the mouth of that mighty stream," he observed, "is a thing Baltimore and other Atlantic cities should carefully and without delay consider."[68] Craighill was obviously emotionally attached to Baltimore and he wanted to see his city gain pre-eminence above all commercial rivals. Not only should the harbor be dredged, but the city should push for the construction of a ship canal to connect Chesapeake and Delaware Bays. Such a canal, Craighill pointed out, would shorten travel-miles for vessels from Baltimore to the Atlantic Ocean.[69] Three days later a *Sun* editorial echoed the ideas Craighill had expressed in his letter. It said that railroads which come eastward "have a natural interest in seeing the improvements in the . harbor of Baltimore maintained and continued, and in promoting the construction of the proposed ship canal [between Chesapeake and Delaware Bays] which should be completed and in use as speedily as possible."[70]

Construction of the Chesapeake and Delaware ship canal would have to wait until after World War I. Congress did authorize a survey of proposed routes in 1878. N. H. Hutton, now an assistant engineer to Craighill, in his study compared and contrasted three possible routes without formulating a final judgement as to which course would be best. The city preferred a middle route that passed through Queenstown, Maryland, because it was relatively close to Baltimore's main harbor. Hutton estimated it would cost $16 million. The southern route, through Ferry Creek near Cambridge, Maryland, would cost twice that much and therefore was given little consideration. Hutton calculated that a northern course, running only ten miles south of the original Chesapeake and Delaware Canal, would be the cheapest at $8 million.[71] Such a course, however, would favor Philadelphia. Craighill, noting the zeal of the advocates of the respective canal paths, proclaimed that he did "not intend to become a lobbyist for either route . "[72]

The proper route for the proposed canal continued to be debated during the next four decades. Craighill regretted the inaction; the canal, he believed, was vital to Baltimore. "Baltimore . . very naturally is extremely anxious to be brought nearer . . to the ocean," Craighill wrote the Chief of Engineers in 1882. Although the city was closer to the West than were Philadelphia, New York and Boston, her location near the head of Chesapeake Bay required vessels to haul commerce the whole length of the bay to the ocean. A canal connecting Chesapeake and Delaware Bays would cut the mileage in half.[73]

Although authorization for building such a ship canal was not forthcoming, Craighill's efforts to get the Baltimore harbor channel enlarged were rewarded in 1881 when Congress approved a project to deepen the channel to twenty-seven feet. Even before new dredging began, the Baltimore *Sun* applauded Craighill for "the great service he has rendered to Baltimore by opening and deepening the fine channel that bears his name."[74] The tonnage passing through the port of Baltimore was second only to that of the New York harbor.[75]

IX

Because there were not enough large dredges, excavation on the new project began slowly. However, in 1882 a substantial dredging force and a $450,000 appropriation spurred work to a furious pace. "We have

contracts already with two of the largest dredging firms in the U.S.," Craighill informed the chairman of the Committee on River and Harbor Approaches of the Baltimore Board of Trade; "and are about to enter into a third. It is my belief that the dredging force to be engaged here this year will be the largest ever seen at one place in the U.S. . . ."[76]

The American Dredging Company, of Philadelphia, did cause Craighill some headaches. It was slow in building dredges for the Patapsco because it could not obtain materials. After the necessary equipment arrived, a fire destroyed the company's machine and blacksmith shops and parts of a partially constructed dredge. Once the dredges finally began operating in the river, the company claimed that high winds causing rough seas had retarded the digging.[77] Isaac Albertson, president of the dredging company, also maintained that his firm had been "greatly deceived" into thinking that the material to be dredged would be soft; instead it turned out to be hard clay. Because of this alleged unexpected difficulty the company wanted more than the 10¾ cents per cubic yard provided for in the current contract. Albertson called for "an additional ten (10¢) cents per cubic yard on all the *unreasonably hard* material that may be removed from the cuts yet to be made . . ."[78] While Craighill conceded that some of the river's bottom proved to be harder than had been anticipated, he thought Albertson's charge of deception was an exaggeration. Ultimately, Secretary of War Robert T. Lincoln denied the company's request for higher compensation for work already accomplished and for future excavations.[79]

Congress failed to pass a river-and-harbor bill in 1883, but because of the heavy appropriation of the previous year, the Baltimore harbor dredging project moved forward without a slowdown. To John W. Garrett the importance of achieving a depth of twenty-seven feet had not diminished, and

Patapsco River approach to Baltimore, 1887.—National Archives

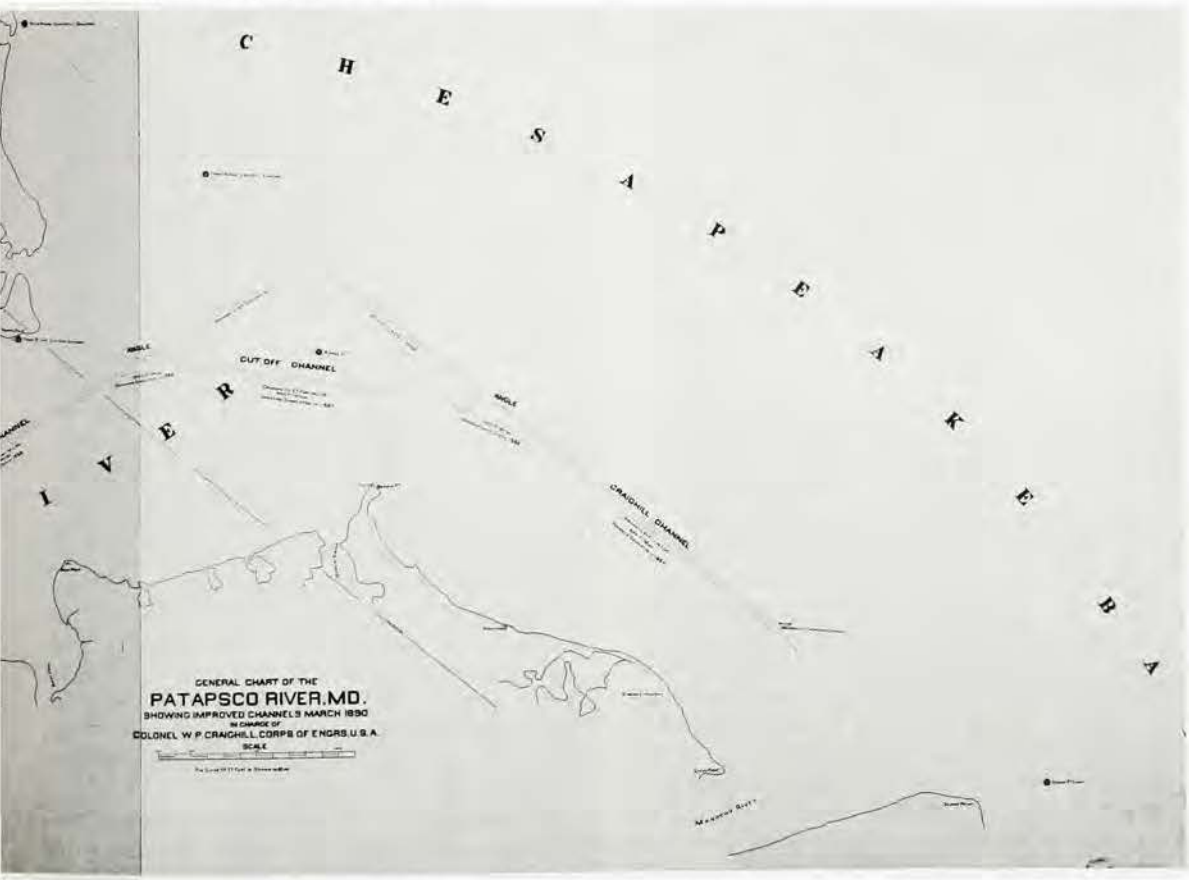
he felt assured that Craighill could continue dredging because of the large sum of money on hand. Many heavy steamships intended to use the port, Garrett wrote to Craighill, "but much depends upon securing the depth of channel . . . at an early day."[80] The Baltimore *Sun*, nevertheless, vented its anger on Congress by chastising that body for "making excessive appropriations for trout-streams and ponds" the previous year while now neglecting to provide funds "for the improvement of real highways of commerce."[81]

The harbor, however, did not suffer in 1883 from Congress's niggardliness. By the end of that year more than 3 million cubic yards of material had been removed from the channel, setting a yearly record for the Baltimore harbor.[82] Digging the twenty-seven foot depth took until the end of 1884.[83] Later, appropriations again became irregular. Craighill put whatever funds became available toward widening old cuts. Because of a lack of money, in the spring of 1885, Craighill ordered the channel cleared of dredging machines. He used the opportunity to survey the dredged channel in order to verify progress. The examination showed considerable shoaling along the sides of the Craighill and Brewerton Channels caused by large vessels striking the banks and throwing masses of material into the dredged harbor approaches. The implication was clear; a wider channel was needed.[84]

Insufficient funds caused operations to be suspended entirely during the fiscal year ending 30 June 1886. Only an appropriation of $150,000, granted in August, prevented the year from being a total loss. Nevertheless, by the mid-1880's the Army Corps of Engineers had created an efficient water highway to Baltimore. Through 30 June 1886, the federal government had spent around $2 million on the harbor; the city of Baltimore and the state of Maryland had contributed $584,000.[85]

Meanwhile, Craighill continued to cam-

Patapsco River Channel, 1890.—National Archives



paign privately for more funds. Sometimes his concern that Baltimore become the nation's principal commercial center superseded his duties as a professional engineer. He was particularly anxious that the port receive no publicity which could be detrimental to business. In a letter to John W. Garrett he noted that it would be "a very unwise thing, in the interest of the good name of the channel and of the commerce of Baltimore . . . for any person to report a vessel aground *'in the channel'* when she is not so, as has to my certain knowledge been often done."[86] In a letter to the Baltimore Board of Trade, he praised the dredging of the channel to a depth of twenty-seven feet but he lamented that it could not be made as wide as desirable for safe navigation. "The great importance of securing additional funds," he told the Board, "needs, therefore, no demonstration."[87] Garrett concurred: widening the channel was an "absolute necessity" in making Baltimore a more valuable port.[88]

Craighill always kept closely allied with Baltimore's business leaders, so he deeply regretted Garrett's death in 1884. In a letter to Garrett's son he eulogized the Baltimore and Ohio Railroad magnate for the strong support he had given "to the effort to obtain a further improvement of the channel, by the attainment of a depth of 27 feet . . . This last advance gave to Baltimore a better water channel than either Philadelphia or New York has."[89]

Craighill thanked the entire business community of Baltimore in 1886 for cooperating in the campaign for channel improvement. But he warned against complacency. Further excavation of the Patapsco River was mandatory. "Greater width of channel is still required," he implored, "and for that we must continue to labor." With a trace of bitterness he concluded: "The whole depth and width might have been had in 2 or 3 years and at less cost if the money had been at once provided and not been doled out in driblets year by year with an occasional failure in the annual appropriation."[90] Charles D. Fisher, President of the Baltimore Board of Trade, responded by offering the Board's full support. He wrote Craighill that he was "fully determined that all the influence possible from here shall be brought to bear upon Congress to give us a proper appropriation at the next session so that the work on the channel can go on . . ."[91]

Craighill was also fortunate in having cordial relationships with members of Congress. He corresponded frequently with Maryland Senator Arthur Pue Gorman on the compelling need to wrench more money from Congress for the Baltimore harbor. "I was very anxious indeed," Senator Gorman assured Craighill in 1887, "to have you begin at an early day the widening of the channel and complete that work, so that it will remain always as a monument to your skill as an Engineer . . " According to the Senator, no officer in the Corps exerted as much weight in the Senate Committee on Commerce as did the Baltimore District Engineer.[92]

When Gorman asked Craighill for a confidential letter outlining the need for a large appropriation for widening the harbor, Craighill responded by urging a grant of not less than $600,000.[93] In the end he received half that sum. Nevertheless, Congress, in its Rivers and Harbors Act of 1888 authorized a main channel width of 600 feet.

X

By December 1892 and almost a million dollars later, Baltimore had a channel twenty-seven feet deep and 600 feet wide throughout. Contractors carried on the dredging so efficiently that they finished six months ahead of schedule.[94] The work had not progressed without several hitches, however. In 1890, the National Dredging Company accused the Baltimore District Engineer of condoning an illegal combination in contract bidding. The vice president of the National Dredging Company claimed that seven other companies "made their bid under a combination and agreement, by which it was arranged between them, that the American Dredging Company should make the lowest bid, and afterwards, share its business with the other members of the combination."[95] There is no evidence to substantiate the charge, and apparently Craighill took no action. Neither is there any record that there was ever a thorough investigation of the charges. The American Dredging Company, largest in the country, got the contract.

Two years earlier, that same company had become embroiled in a bitter dispute with Assistant Engineer N. H. Hutton, immediate

superintendent of the harbor dredging. The company accused Hutton of consciously trying to drive its dredges from the harbor by placing unreasonable demands on its workmen and by using rude language in his daily persecutions that had a demoralizing effect. The president of the American Dredging Company withdrew the dredge *Republic* from the force digging in the Brewerton Channel "as she appears to be the target for most of your [Hutton's] attack, or spite work . "[96] Further, the company criticized Hutton for placing dredges on both sides of the Brewerton Channel at the same time, obstructing navigation and thus exposing the whole plant to higher risk of collision. Besides, it said, Hutton forced the dredges to operate headed westerly and against the prevailing fall winds and thus keeping workmen and a portion of the dredges constantly wet. President Albertson of the American Dredging Company concluded a letter to Craighill by describing Hutton as arbitrary, unreasonable and a difficult burden to bear.[97]

Contractor Thomas Potter, of New Jersey, whose company had toiled in the harbor during the humid summer of 1884, joined in criticizing Hutton. He characterized Hutton as a tyrant who willfully and with malice ignored and repudiated written instructions from the District Engineer. Along with causing him to lose thousands of dollars, Potter charged that Hutton had deliberately endeavored to degrade and discredit him as a contractor. "Because of the treatment received at his hand," Potter emphatically declared, "I removed my plant from Baltimore, and would not *at any price* contract to do work under him."[98]

It came as no surprise when Hutton denied all accusations leveled against him. While the complaints were vociferous and bitter, they also had a vague feature about them. Much of the dispute seemed to spring from personality clashes rather than being a genuine debate over engineering practices. Perhaps Hutton had merely been too diligent in his duties, supervising more closely than the companies liked. Besides, he superintended the excavation of Baltimore harbor for many years and had done excellent work in the past. But it was also obvious that he and the American Dredging Company could not maintain a satisfactory working relationship. Therefore, Craighill decided to alleviate the complaints of his largest contractor by dividing Hutton's responsibilities and appointing a new supervisor to manage the American Dredging Company contract. The company happily received the new superintendent and promised to resume work with all its dredges.[99]

Another irritation was the persistent violations of the harbor channels by watermen dragging the bottom for oysters. As he had done some years earlier, Craighill again warned in 1882 that oystermen could destroy the channel by constantly raking the river's floor. At that time Maryland law forbade oyster dredging within 500 yards of either edge of the Craighill Channel. Violators would lose their fishing licenses. The Baltimore District Engineer wanted this prohibition extended to include the cut-off between the Brewerton and Craighill channels. He suggested that the state erect a large sign in a conspicuous place calling attention to the law and the penalty for its violation.[100]

In 1894, the Maryland legislature did extend the oyster-raking prohibition to include the Brewerton and Craighill Channels cut-off. Nevertheless, enforcement seemed to be spasmodic. Craighill noted numerous violations in 1886 and informed the Maryland governor in 1894 "that the law is again being violated, and it seems my duty to appeal to you for such action as may seem expedient in order to prevent a worse condition than now exists." Craighill counseled that publication of a warning notice in local newspapers and "an occasional appearance of one of the oyster police boats would probably be all that is needed."[101]

While watermen, pursuing their livelihood, disobeyed the law, small steamers passing through the channel often caused inconvenience and delay to the Corps dredging operations. No law compelled small vessels drawing only eight to twelve feet to steer clear of the Patapsco ship channel and all too frequently they ran too close to the dredges, sometimes causing work to stop. The Baltimore District Engineer hoped that the vessels' owners would order their captains to avoid traveling so close to the dredges if possible.

With large steamers the trouble was different. Too often they passed by the dredges at full speed, causing terrific swells that broke anchor lines, stakes and tide gauges and forced dredging delays of up to an

entire day. The second lieutenant in immediate charge of the operations saw an easy solution to the problem; if the boats would simply slow down, the potential for damage would be significantly reduced. The Baltimore Board of Trade supported the idea and distributed a circular letter to various shipping companies urging cooperation with those directing the dredging in order to minimize delays and damages. Secretary of War Elihu Root issued a series of regulations, to take effect on 20 March 1901, governing use of the main ship channel. They explicitly prohibited steamers from passing dredges at faster than six miles an hour.[102]

By the end of the 1870's the dumping of spoil had become a hotly debated issue, and the controversy has persisted until the present day. During 1879, Craighill had to force a city contractor to cease dumping sediment from the inner harbor into the Patapsco River where the current and changing tides could wash it down into the recently dredged water highway.[103] In 1899 the District Engineer, Col. Peter C. Hains, manifested concern about the vast quantities of spoil that over the years had been dredged from the Patapsco River and dumped into Chesapeake Bay. Urgently he recommended that it was "now indispensable that precise data should be obtained of its effect upon the navigable portions of the Bay." He surmised that such a survey might show that future deposits would have to be placed behind bulkheads.[104]

XI

A major project of the 1890's was the dredging of Curtis Bay, a tributary of the Patapsco River near Baltimore, to connect it with the main channel. Excavation to the main channel of about one mile seemed necessary because of the erection of a large sugar refinery at Curtis Bay. Of course, the government, not the company, paid for the improvement. Government promotion of business in the form of subsidies or technical assistance was not unusual. The Corps of Engineers had helped build the nation's transportation network from the early days of the Republic.

In 1892 Congress approved the Curtis Bay project, providing for a channel 150 feet wide and twenty-five feet deep. With $28,000 in 1892 and $12,000 more in 1894, the Corps did the excavating. Enlargement of the channel stimulated the building of other manufacturing plants and wharves in Curtis Bay. The Baltimore and Ohio Railroad constructed coal piers in the vicinity and the South Baltimore Car Works, the South Baltimore Foundry and the Ryan-McDonald Manufacturing Company, makers of locomotives and machinery, all settled in the area. The main harbor at Baltimore was becoming crowded and Curtis Bay provided an excellent additional outlet for these industries.[105]

For the main channel itself, in 1896 Congress approved a project to deepen it to thirty feet and to widen it to 1,200 feet in the angles. Colonel Hains, who became District Engineer in May 1895, believed that with liberal appropriations the entire enlargement could be finished in five years. The commercial expansion of Baltimore appeared to him to justify an effort to complete it by that time. The cost would be more than $2 million.[106]

Unfortunately, the Spanish-American War interrupted the digging, but by the turn of the century dredging the thirty-foot depth was well under way with the $450,000 appropriated in 1896.

XII

By the time the War with Spain broke out in 1898 the Corps of Engineers had transformed the port of Baltimore into one of the world's major harbors. At a time when water transportation was the only means of crossing the oceans, the Baltimore Engineers constructed an artificial highway of water over which the largest cruisers of the day could pass. What had been a shallow channel seventeen or eighteen feet deep was now thirty feet deep and 600 feet wide in some places. The effects on the city of Baltimore and the state of Maryland as a whole cannot be overestimated. Without the excavation of the Patapsco channel Baltimore could not have remained an important port city. Opening the harbor allowed the city to become a prominent Eastern commercial center. Firms that produced grain, cloth and machinery settled in the city because of its ready access to the high seas. By 1898, the volume of annual commerce passing through the port had increased $107,687,375 in value

since the beginning of major improvements in 1852.[107]

William P. Craighill, who arrived in Baltimore as a major, left after thirty years in 1895 to become a brigadier general and Chief of Engineers in Washington, D.C. Since 1888 he had served simultaneously as Baltimore District Engineer and as Division Engineer for the Southwest Division. He departed after having profoundly influenced the shaping of the Baltimore harbor. The Baltimore Harbor Commissioners expressed their debt to Craighill when in 1883 they praised his intelligent direction, advocacy and zeal.[108] Secretary of War Robert T. Lincoln marveled at Craighill's success in performing his duties and told him in 1885 "that there is no officer in the army for whom my esteem is greater than it is for you."[109] The Baltimore *Sun* wished him well in his new position as Chief of Engineers and thanked him for "securing a splendid deep-water channel for the expanding commerce of this port of Baltimore."[110] Certainly from the Civil War to 1895 Craighill was the most influential personality behind the excavation of the Patapsco channel. Baltimore harbor was, as Senator Arthur Pue Gorman had hoped in 1887, a monument to Craighill's skill as an engineer.[111]

Craighill served as Chief of Engineers until 1897 when he voluntarily retired after a distinguished career as a military engineer. But his reputation had never been confined to the precincts of the army as was shown by his election as president of the American Society of Civil Engineers in 1894. He was the first army officer to attain that distinction. His last years were spent in Charlestown, West Virginia, surrounded by his family and his books. He died on 18 January 1909. The *Baltimore American* placed Craighill's contribution in perspective by reminding its readers that before he had undertaken the massive excavation of the Patapsco River, most of the commerce coming into the port had to be unloaded on lighters twenty miles below the inner harbor. "To the man who brought the world's commerce into the port of Baltimore and thereby did much to revive the pristine glory of the days of the clipper ships, under the new conditions of ocean liners, the *American* editorialized, "this city will always be indebted."[112]

Footnotes to Chapter IV

[1](1)M.V. Brewington, *Chesapeake Bay: A Pictorial Maritime History* (Cambridge, Md.: Cornell Maritime Press, 1956), p. 118. (2) U.S. Engr. Dept., Baltimore, Md., "Historical Summary of the Baltimore District Office (Jan 1944), p. 2. In Hist Instal File, Recs Mgt Br, Baltimore Engr Dist.

[2]Survey of harbor of Baltimore submitted by Sec Navy; H. Doc. 13, 19th Cong, 2d sess., 18 Dec 1826. In *Roads and Canals*, vol. X, p. 6 All dimensions given in the text are at mean low water.

[3]Annual Rpt, Brig Gen Charles Gratiot, CofEngrs, 30 Nov 1836. Pt of Annual Rpt, Sec War, 24th Cong., 2d sess., 6 Dec 1836. In *Amer St Papers; Mil Aff*, vol. VI, doc. 699, p. 852.

[4](1) *Index to Rpts, CofEngrs, 1866-1912, On Rivers and Harbors*, vol. I (Washington: GPO, 1915), p. 366. (2) Sec War, Rpt. on Internal Improvements. S. Doc. 115, 24th Cong., 2d sess., 24 Jan 1837. In *Roads and Canals*, vol. XXXVIII, p. 17. (3) Hill, *Roads, Rails and Waterways*, p. 181.

[5]Ltr, Capt Henry Brewerton to Brig Gen Joseph G. Totten, 19 Nov and 13 Dec 1852. Rec Gp 77, entry 968, vol. I.

[6]*Ibid.*, 28 Oct 1853.

[7]*Ibid.*, 7 Nov 1853.

[8]Annual Rpt, CofEngrs, App. U, Nov 1874, p. 19.

[9]Ltr, Brewerton to Totten, 8 Feb 1854 and 3 May 1855. Rec Gp 77, entry 968, vol. I.

[10]Annual Rpt, CofEngrs, 22 Nov 1858, p. 47.

[11]*Ibid.*

[12]Ltr, Foster, temporarily in charge of Baltimore Dist, to De Russy, 30 Dec 1859. Rec Gp 77, entry 968, vol. II.

[13]Through 1858, the federal government spent $120,000 on Brewerton Channel, while the city of Baltimore and the state of Maryland contributed $184,317. Annual Rpt, CofEngrs, Nov 1874, App. U, p. 20.

[14]Ltr, Foster to De Russy, 30 Dec 1859.

[15]Annual Rpt, CofEngrs, 30 Oct 1865, p. 10.

[16]At the same time, the Light House Board obtained an appropriation of $30,000 from Congress for establishing permanent beacon lights in the harbor. Ltr, Craighill to Maj Gen A. A. Humphreys, 4 Sep 1866. Rec Gp 77, entry 968, vol. III.

[17]Baltimore *Sun*, 19 Jan 1909, p. 8.

[18]Ltr, Craighill to James B. McPherson, 20 Oct 1861. James B. McPherson Papers, MS Div, Lib Cong.

[19]Ltr, Brig Gen Richard Delafield, CofEngrs, to Craighill, 30 March 1866. Rec Gp 77, entry 22.

[20]Ltr, Craighill to Humphreys, 23 May 1867. Rec Gp 77, entry 968, vol. III.

[21]*Ibid.*

[22]Annual Rpt, CofEngrs, Nov 1874, App. U, p. 21.

[23]Ltr, Col John H. Simpson to John Lloyd, Supt of Dredges, 3 Aug 1869. Rec Gp 77, entry 968, vol. IV.

[24]Annual Rpt, CofEngrs, 25 Oct 1869, App. O, p. 375.

[25]Ltr, Simpson to Humphreys, 7 Oct 1869. Rec Gp 77, entry 968, vol. V.

[26]Open ltr, Simpson to Mariners, 25 Nov 1869. Rec Gp 77, entry 968, vol. IV.

[27]Ltr, Simpson to George U. Porter, Sec, Baltimore Bd of Trade, 8 June 1870. Rec Gp 77, entry 968 vol. IV.

[28]Ltr, Simpson to Lloyd, 3 Aug 1869.

[29]Ltr, Simpson to Gen William T. Sherman, G, Army of U.S., 29 Sep 1869. Rec Gp 77, entry 968, vol. IV.

[30]Ltr, N. H. Hutton, formerly Asst U.S. Engr, to Simpson, 30 Sep 1869. Rec Gp 77, entry 968, vol. IV.

[31]Ltr, Simpson to John A. Creswell, PostMG of U.S., 21 Jul 1870. Rec Gp 77, entry 968, vol. IV.

[32]Ltr, Craighill to Humphreys, 16 Dec 1870. Rec Gp 77, entry 25, box 9.

[33]Ltr, Simpson to Humphreys, 3 Sep 1870. Rec Gp 77, entry 968, vol. V.

[34]John H. Baldwin replaced Dempsey on 19 Oct 1870. Although Simpson preferred the reappointment of Ronsaville, he registered no complaints about Baldwin's work. *Ibid.*, 17 and 19 Oct 1870.

[35]Ltr, Craighill to Humphreys. Rec Gp 77, entry 968, vol. VII.

[36]Annual Rpt, CofEngrs, Nov 1874, App. U, p. 21.

[37]*Ibid.*, 22 Oct 1871, App. Q, p. 589.

[38]Baltimore *Sun*, 10 Apr 1871.

[39]*Ibid.*, 16 Jan 1872.

[40]*Ibid.*, 20 March 1871.

[41]*Ibid.*, 13 Dec 1871.

[42]Copy of ltr, John L. Thomas, Collector of Port of Baltimore, to Craighill, 10 Aug 1872. *Ibid.*, 9 Oct 1872.

[43]Ltr, Craighill to Humphreys, 21 Jun 1872. Rec Gp 77, entry 969, vol. II.

[44]Ltr, Craighill to Joshua Vansant, Chmn, Patapsco River Improvement Bd, 1 Jan 1873. Rec Gp 77, entry 969, vol. III.

[45]Ltr, Curtis and Forbes & Co to Craighill, 16 Apr 1873. Rec Gp 77, entry 997, box 2.

[46]Baltimore *Sun*, 6 Jan 1874, p. 4.

[47]Annual Rpt, CofEngrs, Nov 1874, App. U, p. 22.

[48]*Ibid.*

[49]Baltimore *Sun*, 3 Jul 1874.

[50]Annual Rpt, CofEngrs, Nov 1874, App. U, p. 23.

[51]*Ibid.*

[52]Ltr, Craighill to Humphreys, 30 Jul 1872, Rec Gp 77, entry 968, vol. III.

[53]*Ibid.*, 4 Oct 1876. Rec Gp 77, entry 968, vol. VIII.

[54]Annual Rpt, CofEngrs, 21 Oct 1876, App. F, p. 287.

[55]Ltr, William Keyser, VP, B&O RR, to Craighill, 26 June 1876. Rec Gp 77, entry 997, Box 6.

[56]Annual Rpt, CofEngrs, 12 Oct 1877, App. F, pp. 278, 280.

[57]*Ibid.*, p. 280.

[58]*Ibid.*, 20 Oct 1879, App. F, p. 496.

[59]*Ibid.*, p. 497.

[60]*Ibid.*, 12 Oct 1877, App. F, p. 273.

[61]*Ibid.*, 21 Oct 1876, App. F, p. 285.

[62]*Ibid.*

[63]*Ibid.*, 12 Oct 1877, App. F, pp. 273–74

[64]Ltr, Craighill to Humphreys, 31 Aug 1876. Rec Gp 77, entry 968, vol. VIII.

[65]Ltr, Keyser to Craighill, 23 Dec 1876, Rec Gp 77, entry 997, box 6.

[66]Ltr, William R. Hutton, Engr, C&O Canal Co, to Craighill, 20 Jan 1879. Rec Gp 77, entry 997, box 9.

[67]Ltr, Craighill to John W. Garrett, Pres, B&O RR, 3 May 1880. Rec Gp 77, entry 969, vol. V.

[68](1) Ltr, Craighill to Arunah S. Abell, Baltimore *Sun*, 12 Nov 1880. Nat Archives, Rec Gp 77, entry 969, vol. V. (2) Gen. G. A. Fillmore of the Mississippi River Commission warned Craighill in July 1880 that unless Eastern ports improved their terminal facilities, "the great bulk of our cereals and cotton sent abroad will go by way of the Gulf of Mexico." Ltr, Fillmore to Craighill, 20 Jul 1880. Rec Gp 77, entry 997, box 11.

[69]Ltr, Craighill to Abell, 12 Nov 1880.

[70]Copy of editorial in Baltimore *Sun*, 15 Nov 1880. Rec Gp 77, entry 969, vol. V.

[71]Ltr, Craighill to Humphreys, 7 Feb 1879. Rec Gp 77, entry 969, vol. V.

[72]Ltr, Craighill to Brig Gen H. G. Wright, CofEngrs, 20 Dec 1880. Rec Gp 77, entry 969, vol. V. (3) In a letter written in 1885, Craighill sharply criticized the proposed northern route. Although he acknowledged that it would probably be cheaper, he declared it was "not the best for Baltimore or the country generally." He did not elaborate on his reasons for such a judgment, but he probably thought that building the canal at such a location would place Baltimore at a disadvantage compared with Philadelphia. Ltr, Craighill to James L. Randolph, 22 Oct 1885. Rec Gp 77, entry 969, vol. VII.

[73]Ltr, Craighill to Wright, 6 Dec 1882. Rec Gp 77, entry 969, vol. VI.

[74]Baltimore *Sun*, 24 Feb 1881, p. 2.

[75]Annual Rpt, CofEngrs, 22 Oct 1881, pp. 134–35.

[76]Ltr, Craighill to J. Carey Coale, Chmn, Committee on River and Harbor Approaches, Baltimore Bd of Trade, 21 Mar 1883. Rec Gp 77, entry 969, vol. VI.

[77]Ltr, Isaac Albertson, Pres, Amer Dredging Co, to Craighill, 9 Jun 1882. Rec Gp 77, entry 997, box 14.

[78]*Ibid.*, 19 Jan and 21 Aug 1882.

[79](1) N, Wright to Sec War Robert T. Lincoln, 12 Oct 1882. Rec Gp 77, entry 77, box 214. (2) Ltr, Lincoln to Wright, 30 Dec 1882, Rec Gp 77, entry 997, box 15.

[80]Ltr, Garrett to Craighill, 14 March 1883. Rec Gp 77, entry 997, box 15.

[81]Baltimore *Sun*, 6 March 1883, p. 2.

[82]Annual Rpt, CofEngrs, 15 Oct 1884, p. 142.

[83]*Ibid.*, 16 Oct 1885, p. 138.

[84]*Ibid.*, App. I, p. 918.

[85]*Ibid.*, 26 Oct 1886, p. 134; 22 Oct 1887, p. 99.

[86]Ltr, Craighill to Garrett, 15 Feb 1883. Rec Gp 77, entry 969, vol. VI.

[87]Ltr, Craighill to Coale, 21 Mar 1883.

[88]Ltr, Garrett to Craighill, 3 Nov 1883. Rec Gp 77, entry 997, box 15.

[89]Ltr, Craighill to Robert Garrett, 30 Sep 1884. Rec Gp 77, entry 969, vol. VII.

[90]Ltr, Craighill to Charles D. Fisher, Pres, Bd of Trade of Baltimore, 17 Sep 1886. Rec Gp 77, entry 969, vol. VII.

[91]Ltr, Fisher to Craighill, 1 Sep 1887. Rec Gp 77, entry 994, box 6.

[92]Ltr, Sen Arthur Pue Gorman of Md to Craighill, 9 Mar 1887. Rec Gp 77, entry 994, box 6.

[93](1) *Ibid.*, 15 Feb 1888. (2) Ltr, Craighill to Gorman, 11 May 1888. Rec Gp 77, entry 969, vol. VII.

[94]Annual Rpts, CofEngrs, 30 Sep 1892, p. 133; 19 Sep 1893, p. 144.

[95]Ltr, George G. Barker, VP, Nat Dredging Co, to Craighill, 27 Dec 1890. Rec Gp 77, entry 994, Box 7.

[96]Ltr, Albertson to Maj N. H. Hutton, 7 Nov 1888. Rec Gp 77, entry 994, box 7.

[97]Ltr, Albertson to Craighill, 23 Nov 1888. Rec Gp 77, entry 994, box 7.

[98]Ltr, Thomas Potter to Craighill, 7 Feb 1889. Rec Gp 77, entry 994, box 7.

[99](1) Ltr, Hutton to Craighill, 17 Nov 1888. (2) Ltr, Albertson to Craighill, 21 Feb 1889. (3) The president of Atlantic Dredging also complained about Hutton's work. He wrote to Craighill that his company "decided several years ago that we would not do any work over which Maj. Hutton has control." He did not elaborate on his reasons. Ltr, R. G. Packhard, Pres, Atlantic Dredging Co, to Craighill, 22 Feb 1889. Rec Gp 77, entry 994, box 7.

[100](1) Ltr, Craighill to Brevet Brig Gen Orville E. Babcock, Lighthouse Engr, 5th Dist, 9 Jan 1882. (2) Ltr, Craighill to William Hamilton, Gov of Md, 12 Jan 1882. Rec Gp 77, entry 969, vol. VI.

[101](1) Laws, St of Md., chap. 30, sec. 50, passed Jan 1894. Rec Gp 77, entry 994, box 8. (2) Ltr, Craighill to Frank Brown, Gov of Md, 2 Jan 1894. Rec Gp 77, entry 969, vol. VIII.

[102](1) Ltr, Lt Charles W. Kutz to Col Peter C. Hains, Baltimore Dist Engr, 29 Apr 1897. (2) Ltr, Eugene Levering, Pres, Baltimore Bd of Trade, to various steamboat companies, 7 May 1897. Rec Gp 77, entry 994, box 8. (3) Ltr, Hains to Chester River Steamboat Co, 10 Jul 1897. Rec Gp 77, entry 969, vol. IX. (4) Sec War Elihu Root, Regs for use of main ship channel leading to Baltimore. 20 Mar 1901. Rec Gp 77, entry 994, box 9.

[103](1) Ltr, W. H. Richardson, Justice of Peace for St of Md., to John L. Thomas, Collector, Port of Baltimore, 29 Sep 1879. (2) Ltr, Thomas to Craighill, 3 Oct 1879. Nat Archives, Rec Gp 77, entry 997, box 10.

[104]Ltr, Hains to Baltimore Dredging Co., 6 Mar 1899. Rec Gp 77, entry 985, vol. VI.

[105](1) Ltr, Craighill to Brig Gen Thomas L. Casey, CofEngrs, 7 Jun 1890. Rec Gp 77, entry 969, vol. VII. (2) Ltr, Craighill to U.S. Rep Isidor Rayner of Md, 8 May 1894. Rec Gp 77, entry 969, vol. VIII. (3) Ltr, Kutz to Brig Gen John Wilson, CofEngrs, 21 Dec 1899. Rec Gp 77, entry 985, vol. VII.

[106]Ltr, Hains to H. C. Landis, Sec, Baltimore Bd of Trade, 14 Sep 1896. Rec Gp 77, entry 984, vol. XIV.

[107]Annual Rpt, CofEngrs, 29 Sep 1898, p. 176.

[108]Baltimore *Sun*, 3 Feb 1883, p. 2.

[109]Ltr, Sec War Robert T. Lincoln to Craighill, 2 Mar 1885. Rec Gp 77, entry 997, box 16.

[110]Baltimore *Sun*, 13 May 1895, p. 4.

[111]Ltr, Gorman to Craighill, 9 Mar 1887.

[112](1) *Baltimore American*, 19 Jan 1909, p. 8. (2) Baltimore *Sun*, 19 Jan 1909, pp. 4, 8. (3) Assn of Grads, USMA, Annual Reunion, XL (10 Jun 1909), pp. 106–36.

Chapter V
Broadening Commercial Horizons: River and Harbor Improvements after the Civil War

During the period after the Civil War, the Corps of Engineers was in charge of river and harbor projects throughout the country on a scale far broader than in prewar years. Even after the railroads marched West during the late nineteenth century, river transportation was visualized as an adjunct to rail travel and as a useful competitor. Farmers favored waterways improvement in order to provide alternate transportation and at freight rates lower than those of the Iron Horse, which they sometimes viewed as oppressive.[1]

Many river-and-harbor projects by the Corps of Engineers during the nineteenth century helped tie the nation closer together economically. The contributions of the Corps of Engineers to river and harbor improvements, by providing technical education, surveying practices, supervision and other skills, were important in stimulating westward expansion and economic growth. In short, the Corps of Engineers had the scientific skills, and for that reason it led the nation in domestic civil works. Improving and expanding communications became the first priority. The vast North American continent seemed ripe for being harnessed for man's uses.

II

For the Baltimore District of the Army Corps of Engineers, the main thrust into river and harbor operations came after 1870. Before that, the only project besides the major work on the Baltimore harbor was the removal of obstructions at the mouth of the Susquehanna River near Havre de Grace, Maryland. Little was really accomplished at this site before the outbreak of hostilities in 1861.

The Susquehanna River rises at Lake Otsego in New York state and flows through Pennsylvania, entering Chesapeake Bay near Havre de Grace. The river is bordered by rugged country on both sides bounded on the east by the Catskill and Pocono Mountains, and on the west by the Allegheny range.[2] The object of early improvement was to remove two shoals that limited the size of boats traveling down river into the bay. All the coal and lumber trade of the Susquehanna Valley passed through the channel that had to be excavated.

Although authorization for dredging these shoals came in 1852, nothing was done for several years because of lack of funds and equipment. District Engineer Capt. Henry Brewerton noted in early 1853 that the trade of Havre de Grace was carried on by vessels that drew at least nine feet. He hoped that if the water over the shoals were deepened, "eastern vessels of a larger class will be induced to visit the port of Havre de Grace, for the purpose of participating in the coal trade." He wanted enough money to make the channel at least ten feet deep.[3]

Eradication of the shoals finally began when in 1858 Brewerton was forced to

suspend operations on the Patapsco River because of lack of funds. He still had $10,000 to use on the Susquehanna; so instead of allowing the equipment to rust on the Patapsco, he sent three dredges and a steam tug to Havre de Grace. By the autumn of 1859 he had exhausted the $10,000 after 19,350 cubic yards of material had been dredged.[4] Unfortunately, the Civil War stalled all further progress. An examination of the dredged channel in June 1866 showed that the entire cut had so filled up that the river was in the same condition it had been in before the digging of 1858.[5]

Obviously, dredging alone would not keep the channel open to vessels that drew more than ten feet. To solve the problem the District Engineer, Maj. William P. Craighill, recommended that a floating dam be placed in the river to deflect the current at Havre de Grace, thus enlarging the flow of water through the channel and deepening it. The deflector would be constructed from rafts chained together, each raft containing a row of sheet piling which would penetrate the bottom to steady the floating dam. If the deflector proved effective, it could be replaced later by a permanent stone jetty.[6]

With $26,400 appropriated in 1867, work began on redredging and constructing the deflector. Col. John Simpson, who was in charge of the District in 1868, thought that the benefits resulting from the floating dam's securing a sufficient waterway would be felt beyond the nearby towns of Havre de Grace and Port Deposit. In short, the commercial benefits would be not merely local. In Simpson's view, "the whole trade of the Susquehanna and Tidewater and the Delaware and Chesapeake canals depend upon the availability of this channel; a large portion of the lumber, coal and iron trade of the upper Susquehanna finding here its outlet."[7]

The deflector proved a colossal failure. Placed in the river in November 1868, it survived one week before a severe wind-and-

Map of the Susquehanna River heading into the Chesapeake Bay, 1799.—National Archives

rain storm shattered it to pieces. During its week of service, however, it had deepened the channel perceptibly. Simpson, and Craighill upon his return, both urged the construction of a permanent structure of detached cribs of timber and stone which they estimated would cost $50,000. In lieu of a deflector, each annual dredging would mean an expenditure of about $20,000 each year. Meanwhile, Craighill directed the building of a fixed wooden dike from materials salvaged from the battered deflector. By 1873 the dike had deteriorated beyond the point of usefulness.[8]

Not everyone, however, favored a permanent jetty. Fishing interests feared that such an artificial deflection of the natural current would prevent fish from passing through the channel. Craighill always countered this argument by citing a larger public interest to deepen the channel and acknowledging that improvements by the Corps never pleased everyone.[9] In this instance the fishing interests prevented the jetty from being erected. In 1880, the Maryland legislature condemned the use of a deflector in the Susquehanna, questioning its value to navigation. Craighill disputed the legislature, but to no avail.[10] In 1883 the Chief of Engineers called the use of jetties "positively indispensable" to the permanence of the channel. Congress, he said, would have to decide whether to appropriate money for a jetty or a large annual appropriation for dredging. He admitted that the erection of a jetty was unlikely because of "so much objection . . . made by the large capital and population interested in the fisheries . . ."[11] Congress decided not to approve the deflector plan although the engineer in charge of work at Havre de Grace in 1895 still reiterated the plea for a jetty "to remove the shoal and keep it from reforming . . ."[12]

The main work done on the Susquehanna River near Havre de Grace during the last two decades of the nineteenth century consisted of dredging in various portions of the channel, particularly near Spesutie Island to aid the movements of boats engaged in business with the United States Commission of Fish and Fisheries located in the area. This also included the construction of a crib breakwater to protect the facility's basins and hatching houses from ice flowing down the Susquehanna. In 1886 ice did destroy part of the crib work. During a violent snowstorm in December 1887, accompanied by rapid formation of ice, Craighill quickly realized that if extraordinary exertions were not made immediately to fill the crib with stone, it would be totally destroyed. In the emergency he hired a tug to keep the channel open by breaking up the ice in the river. He also employed men to remove the ice around the crib, and to work in the rain and snow hauling stone through ice and water frequently two feet deep to fill the crib by hand. Such arduous labor required what Craighill termed, "extraordinary inducements," including paying the seventy-six men hired for the job not less than $2.50 a day. To avoid any delays, he also kept the men at the site continuously for three days, supplying them with food hastily picked up from country stores in Havre de Grace. Craighill proudly reported on the last day of December that the "crib was saved, sunk in place and is now in position . . ."[13]

III

It was in 1870 that the Baltimore District became widely involved in other river and harbor improvements besides the Baltimore harbor and the Susquehanna River near Havre de Grace. Maj. William P. Craighill, as District Engineer, superintended these wide ranging projects which included not only Maryland streams, but also the James, Appomattox and Rappahannock Rivers in Virginia and the Cape Fear River in North Carolina. In 1874, the Chief's office added two West Virginia waterways, the Great Kanawha and New Rivers, to his charge. Craighill continued to supervise most of the projects in this broad geographic area until 1888, when he became Southeast Division Engineer. At the same time Craighill continued as the Baltimore District Engineer. In July 1884, however, the Chief's office transferred most of the river and harbor projects in Delaware and Maryland to a suboffice of the District at Wilmington, Delaware. This relieved much of the burden from Craighill; the Baltimore office retained direct control of only Baltimore harbor of all the Maryland projects. William Farrar Smith, former Union general officer and Army Engineer, headed the Wilmington suboffice as a civilian until he retired in May 1901. Thereafter the Engineer Department abolished the office and divided its projects, giving the Philadelphia District

those in Delaware and the Baltimore office the works in Maryland.[14]

IV

In the 1870's and 1880's the Baltimore District cooperated with the city of Richmond to improve navigation on the James River in Virginia. This involved dredging and removing hulks which Union and Confederate forces had sunk in the river during the Civil War. These obstructions comprised sunken vessels sometimes filled with stone, piers of pile bridges and stone-filled cribs. By the summer of 1871, Craighill reported that the removal of obstructions was almost complete. There was now a clear channel in the river 250 feet wide and not less than eighteen feet deep which was "fully appreciated by navigators."[15]

Work on the James River continued under Craighill's supervision for the next two decades, and consisted mainly of dredging and excavating rock around Richmond. In 1876, he observed that over the past six years removal of shoals of rock and graveland sand had doubled the tonnage using the Richmond port. It "is very desirable," he concluded, "to have a further increase."[16] By the end of the 1880's the depth of the James approached twenty feet, much of the rock shoals having been blasted out. The cost to the federal government by 1896 had been about $1.5 million.[17]

Other major projects in Virginia during these years included dredging and building of wing dams on the Appomattox River near Petersburg; dredging the Rappahannock River below Fredericksburg; and excavating the Potomac River around Georgetown in Washington, D.C. Between 1870 and 1880, the federal government spent $200,000 on the Appomattox River, deepening it from three and a half to nine feet.[18]

Beginning in August 1874, attempts to open the Great Kanawha River in West Virginia to large-scale navigation occupied much of Craighill's time. It was not a simple dredging project; it required constructing a series of locks and dams to regulate the water level. Foundations for the dams and locks could be put in only at low tide, forcing periods of vigorous work interspersed with idleness. Several contractors worked simultaneously on the various locks and dams. At

Map of the East Coast in 1888 from New York Harbor to Cape Fear, North Carolina.—National Archives

one point the Chief of Engineers lamented the delays in construction caused by the violence of lawless men among the laborers, but he did not elaborate. Nevertheless, by the mid-1880's several locks and dams had been completed and the Chief of Engineers characterized the development of commerce on the river since the improvement as "remarkable."[19] By the time of the transfer of the Great Kanawha River project to the Cincinnati, Ohio District in 1897, the goal of a six-foot-deep channel made possible by a series of locks and dams was well on the way to completion.[20]

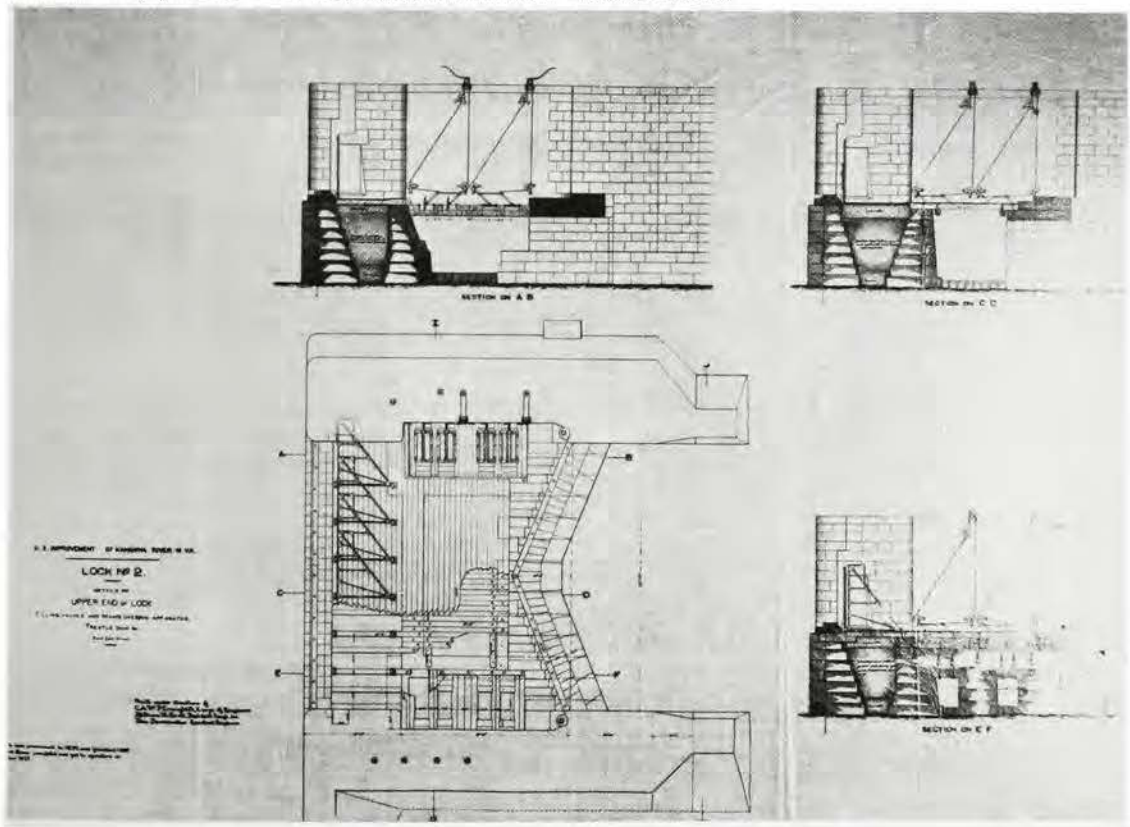
Other major projects in West Virginia included dredging and rock-blasting in the New River from the mouth of the lead mines in Wythe County in Virginia to the mouth of the Greenbrier River in West Virginia to, make the stream usable by keelboats. Also, the Baltimore District Engineer supervised removal of obstructions on the Elk River in West Virginia, including rocks, snags and overhanging trees.[21]

In North Carolina, Craighill oversaw the diversion of the flow of water in the Cape Fear River to create a channel twelve feet deep to the city of Wilmington from the Atlantic Ocean. The main feature of the venture was the closing of New Inlet, an unnatural mouth of the river which had been opened by a fierce gale more than a century earlier. This was accomplished by constructing an apron of timber, brush and stone to block New Inlet and divert the flow of water into the old mouth of the river. By 1880 the dam was largely finished and in 1883 the Chief of Engineers reported that it was in good condition and working well.[22]

V

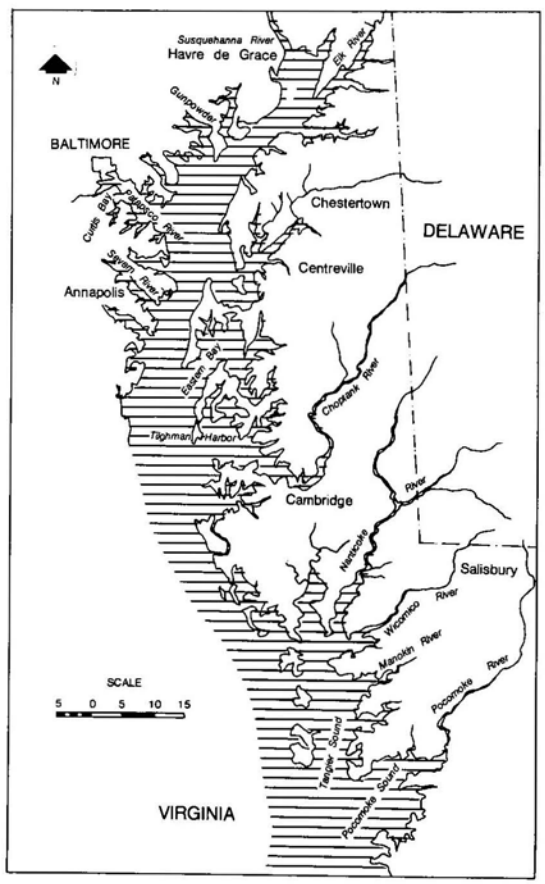
The Baltimore District's real flurry of activity after 1870 took place in Maryland around Chesapeake Bay, the largest inland waterway on the Atlantic coast, nearly 200 miles long with a water surface of 3,232 square miles.[23] Dozens of rivers and creeks

Detailed drawing of the Lock No. 2, Great Kanawha River, 1887.—National Archives



empty into the bay, particularly from Maryland's Eastern Shore peninsula between the bay and the Atlantic Ocean. The projects in this area supervised by the District and the suboffice in Wilmington are numerous. They included Broad and Corsica Creeks; Queenstown, Rock Hall, Cambridge and Annapolis harbors; Chester, Choptank, Elk, Manokin, Nanticoke, Northeast, Pocomoke, Warwick and Wicomico Rivers. District Engineer Craighill feared that it would be difficult, if not impossible, to engage responsible contractors to simultaneously do the work on these Chesapeake Bay harbors and tributaries which Congress would authorize. Nevertheless, as of 1872, except for a few minor streams, work was in progress all around the bay.[24]

Most of these ventures were designed to improve navigation for the benefit of the commercial fishing industry. They encompassed little more than routine contract dredging. Between 1866 and 1883, Congress passed river and harbor bills except the one needed to provide funds for fiscal year 1877.[25]



After a marked expansion of projects during the early 1870's, Craighill noted the sudden contraction during the summer of 1876. He reported that the suspensions had forced him to discharge an assistant engineer, a draftsman, a clerk and others from his office staff. "During the recent period of suspension of operations at almost everyone of the works in my charge," he wrote the Chief of Engineers, "there has been as great a reduction as possible in the numbers of employees of all grades, as well as other expenses."[26] The austerity was only temporary, however; in 1878 the District resumed full-scale surveying and dredging operations.

The first Eastern Shore ventures were at the Queenstown and Cambridge harbors. The Baltimore Engineers surveyed both during the autumn of 1870 for possible expansion. Queenstown is situated on Queenstown Creek about ten miles from the mouth of the Chester River and thirty-six airline miles from Baltimore. In 1870 it was an important mail station for Queen Annes County. Mail traveled on steamers to and from Baltimore every other day. These steamers also carried passengers and freight such as oysters, fish, fowl, cattle, fruits and grain. Heavy parcels could not be hauled without long waits for sufficiently high water.

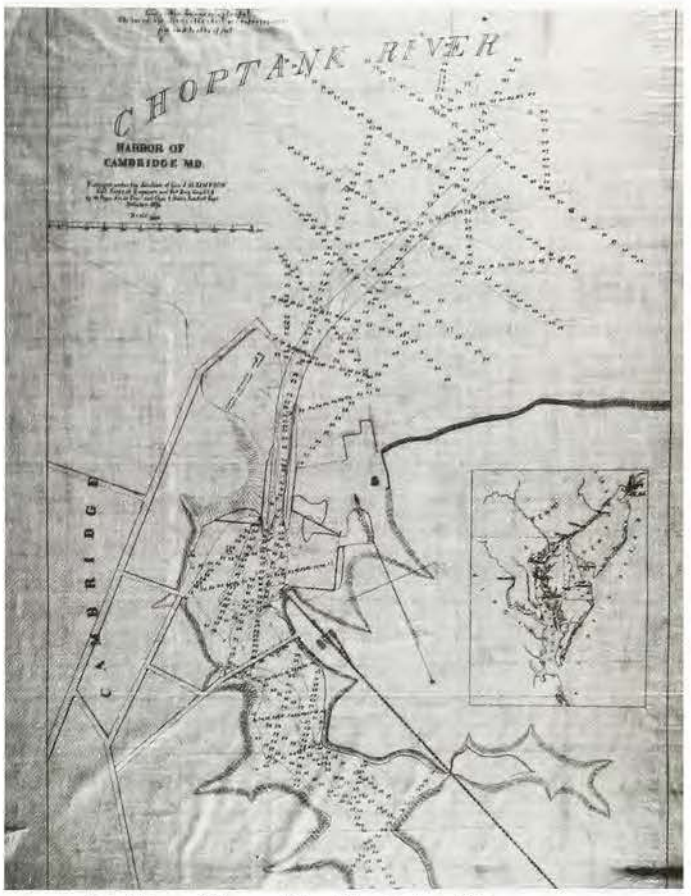
The two assistant engineers who surveyed noted that the harbor itself was in fine condition, having enough area to offer secure anchorage for a dozen large schooners. The channel leading to the town, however, was "narrow, crooked, and shallow, having an average depth of only 6 feet." Opening this approach was important, the Engineers felt, not so much for commercial benefits, but because the harbor was the only one in the area where vessels could seek refuge in case of severe gales. During storms, ships often entered the Chester River by mistake; then their only hope for safety was to reach Queenstown harbor or become lost. Trying to return to the bay or to sail farther up the Chester River was impossible.[27]

The improvement, which the Engineers recommended and Congress approved, provided for a channel to the harbor 100 feet wide and eight feet deep. By November 1872,

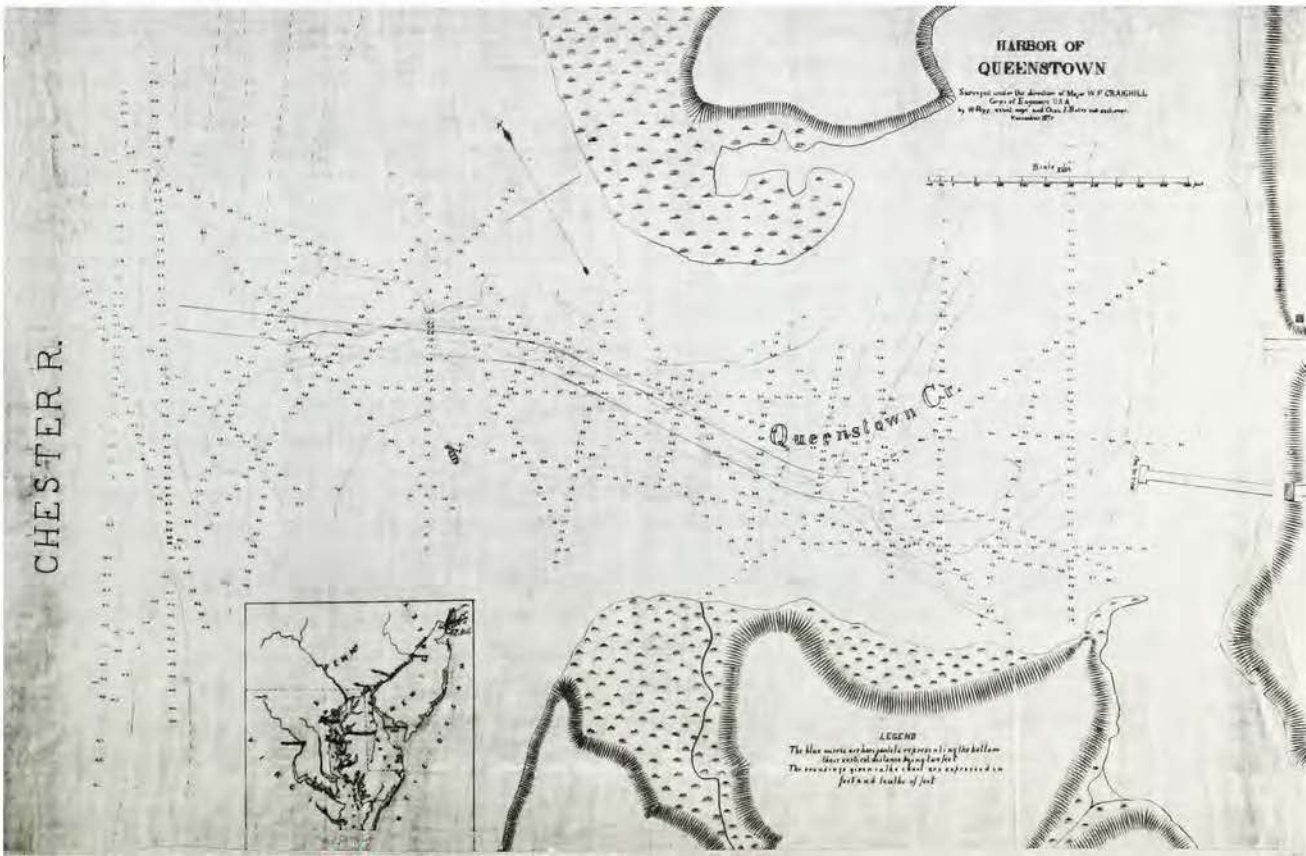
the goal had been reached at a cost of $11,000. Craighill felt satisfied that the channel was now "sufficient for the needs of the place."[28] In 1879, the Engineers let a $3,000 contract for straightening the channel. There was no more work at Queenstown harbor until maintenance dredging began during the late 1890's.[29]

Today Cambridge is one of the most important harbors on Maryland's Eastern Shore. It is on Cambridge Creek, a small recess of the Choptank River, largest of Eastern Shore rivers. Citizens of the town formed their own committee in 1868 to direct harbor expansion, raising $8,000 for dredging the creek. The Engineer survey of October 1870 recommended a federal project to excavate the entrance to the Choptank to 100 feet wide and ten feet deep and deepening the interior of the creek and harbor to eight feet. Craighill noted that large quantities of peaches, grain and ship timber were transported along the Choptank and that Cambridge was an enterprising town "whose importance would be greatly increased if the assistance of the General Government could be given toward the improvement of the harbor and its entrance."[30]

Between 1871 and 1879, the federal government spent $32,500 on the harbor,



Survey map of the Choptank River and Cambridge Harbor, October 1870.—National Archives



Map showing the results of a Corps survey of Queenstown Harbor, November 1870.—National Archives

$20,000 of which came in 1871 and 1872. Craighill received an additional $5,000 in 1873, although no money had been requested by the Engineer Department. "As the last appropriation for Cambridge was made without my asking for it," Craighill wrote, "I find myself a little embarrassed as to the best disposition to make of it, for the general good."[31] He finally decided to use the money for widening the entrance to the inner harbor, which he acknowledged "is perhaps too narrow."[32]

By the end of the decade Cambridge had a harbor eight feet deep. However, not everyone in the town was pleased. In 1872 one citizen complained that the basin had been dredged to the town wharf while neglecting an area to the west where he was building a new docking facility. He circulated a petition "signed by numerous citizens" and sent it to Craighill referring to the town wharf as an odious monopoly. Craighill characterized the clash of competing interests in Cambridge "more annoying and vexatious, than at any place with which I have had to do in the way of attempting to improve the general commercial facilities." He visited Cambridge and explained that he had spent the dredging money to benefit the most people. "I undertook at Cambridge," he reflected, "first, to bring the deeper water of the Choptank nearer to the town, and to make it available for immediate use by shipping at the only wharves found in use at the time."[33] A few years later, the residents of Cambridge seemed to be more united in their efforts to have their harbor enlarged. In the spring of 1878, Craighill spoke of a unified town taking "a great interest in their harbor" while remarking on the need for more anchorage space to accommodate increased commerce.[34]

Further dredging during the final two decades of the nineteenth century produced a channel 150 feet wide and twelve feet deep from the Choptank River to the railroad wharf in the town, a distance of about a mile. As a result of this excavation of the channel, the oyster fleet made Cambridge the central distribution point on the Choptank River for their industry. The Chief of Engineers observed in 1895 that the improvement had a tremendous influence on the prosperity of Cambridge which since 1870 had more than doubled its population.[35]

On the Choptank River itself, the Corps contracted for dredging from Denton to Greensborough, a distance of eight miles, to accommodate the large trade in grain, lumber and fruit between those two towns and Baltimore. The goal was to excavate a channel eight feet deep and seventy-five feet wide. Before dredging, depth varied for two to eight feet. Small sailing vessels could venture only three miles above Denton before being grounded. On the remaining five miles to Greensborough all freight had to be transported on scows. By the close of fiscal year 1896, almost $50,000 had been expended and the channel was nearly complete, to the apparent betterment of trade. Even as early as 1886, the president of the Choptank Steamboat Company observed that the effects of the dredging "on this particular route have been almost phenomenal in its benefits to commercial interests. . . . Transportation rates have been reduced one half. Real estate greatly enhanced in value. . . . "[36] The establishment of steamboat service to Baltimore in 1887 further helped to stimulate commerce.[37]

To the north of the Choptank, on the Chester River, the second longest river on the Eastern Shore, the Corps undertook several dredging operations to connect the towns of Jones Landing, Crumpton, Chestertown and Kent Island to Chesapeake Bay and Baltimore. The first project was to dredge the Chester River at Kent Island Narrows. Kent Island is sandy-shored and separates the Chester River from Eastern Bay. It is detached from the mainland by the small narrows. Some time around 1820, Queen Annes County built a solid causeway across the narrows which blocked the channel. In 1874, the Maryland legislature consented to removing the causeway and the county promised to erect a drawbridge in its place. At the same time, the Corps of Engineers agreed to drive an opening through the causeway and to dredge a channel 100 feet wide and seven feet deep between the Chester River and Eastern Bay. Dredging commenced after the county completed the drawbridge in 1874, and the channel became operational by 1878 at the originally estimated cost of $25,000. However, the newly opened waterway was traveled infrequently by boats of the area. The Chief of Engineers observed in 1880 that steamboats rarely ventured through the

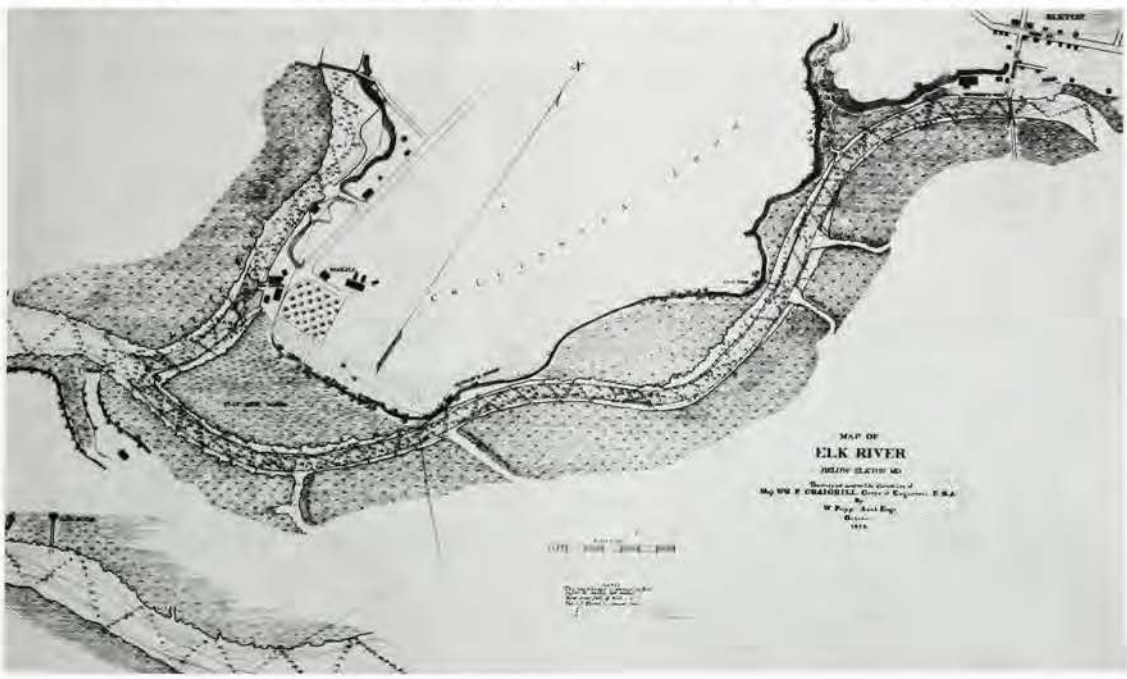
channel and consequently, in his opinion, there was no need for further dredging at the present time.[38]

There was contract dredging on the upper Chester River during the 1880's and 1890's, the main excavation being the digging of a channel six and a quarter miles long, sixty feet wide and six feet deep, from Crumpton to Jones Landing. Craighill noted the river's commercial importance, particularly during autumn when farmers around Chestertown and Crumpton shipped many bushels of corn and wheat.[39] The original estimate of $12,750 for the operations could not be met due to reshoaling that necessitated redredging in some areas. At the close of 1899, 2,440 feet of the river to Jones Landing remained to be dredged. The Assistant Engineer directly in charge indicated that the entire channel would have been finished had it not been "for the shoaling that has taken place . . . since the work was first begun."[40]

To the north of the Chester River runs the Elk and Little Elk Rivers on the northern tip of Maryland's Eastern Shore. During the early 1870's the Corps began constructing a passageway in these tributaries to the town of Elkton. This involved dredging and building a 900-foot dike on the right side of the stream at the town to regulate the water flow over a large bar and to provide a place behind which to deposit dredged material. In the 1880's, with the decay of the timber dike, Craighill had the earth behind it sloped back to form a new bank for the river. This was cheaper and as effective as replacing the timber itself.[41]

As with most of the projects on the Eastern Shore, work progressed with few hitches. However, during the autumn of 1881 Craighill did have trouble with a contractor. He visited the dredging site at Elkton during the last week in October and found the dredge and the entire work force idle for no apparent reason. He became infuriated at the contractor, G. H. Ferris, and this confirmed his suspicion that the whole job had been badly managed from the beginning. He accused Ferris of failing to carefully plan his operations in advance, causing the dredging to take twice as long as necessary. "Your reputation as a contractor has suffered," the Baltimore District Engineer angrily informed Ferris, "and so has mine as an agent of the U.S. in allowing such a shiftless and unbusinesslike execution of a Gov't. contract." G. H. Ferris did no more work on the Elk River.[42]

Survey map of the Elk River made under the direction of Major William P. Craighill, 1875.—National Archives

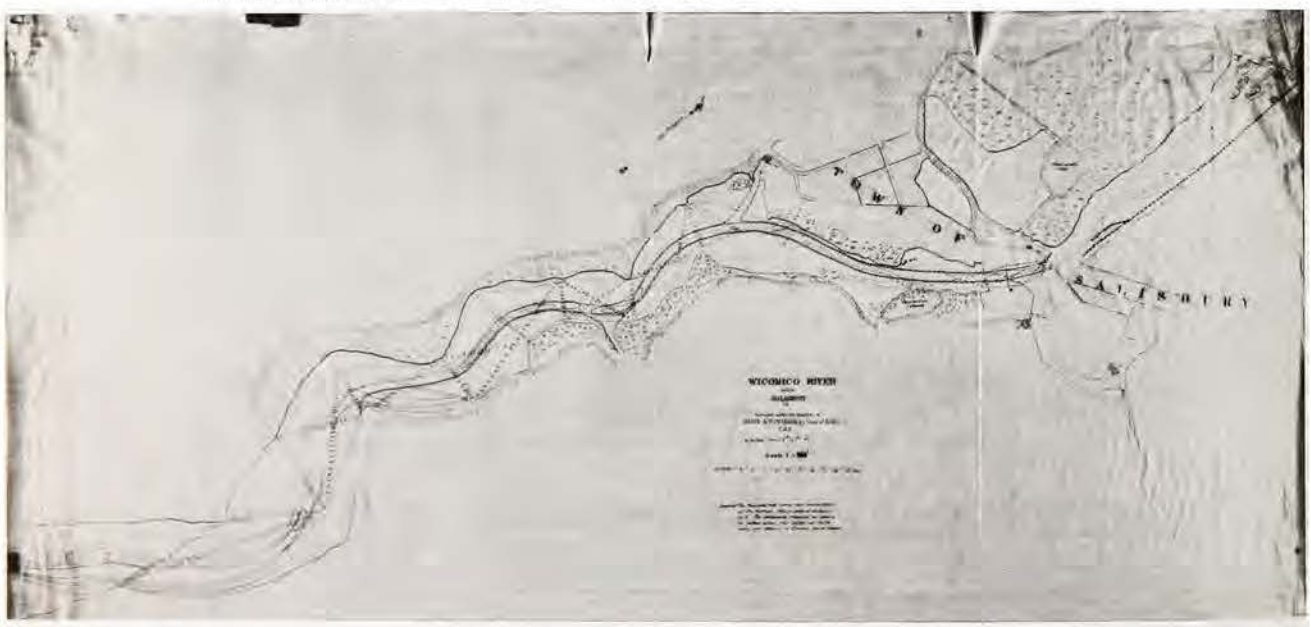


Despite this delay in 1881, the project was finished by February 1885, and provided a channel seventy feet wide and seven feet deep from the mouth of the Little Elk River to Elkton, a distance of 5,900 feet. In addition, a cut had also been excavated 1,000 feet long and seven feet deep through a bar below the mouth of the Little Elk River. This, along with the removal of two cribs of an old pier three miles below Elkton, gave unobstructed navigation to that town. The Chief of Engineers reported that because of the improvement, there had been an increase in the volume of freight on the river and that freight rates had fallen because of the successful competition the stream gave to the railroad.[43] During the 1890's, dredging continued in the Elk River to Elkton, enlarging the channel width to 100 feet and its depth to eight feet. This project continued into the twentieth century.[44]

On the southern Eastern Shore south of the Choptank River the Corps during the late nineteenth century did a little work on the Nanticoke River running to Seaford in Delaware. The river is a tidal estuary that rises in northern Sussex County, Delaware. It flows south-southwesterly and in Maryland forms the boundary between the counties of Dorchester and Wicomico. Most of the dredging occurred in the 1890's around Seaford, thirty-six miles from the stream's mouth. The River and Harbor Act of 17 August 1894 appropriated $5,000 for improving Broad Creek River in Delaware and provided that as much of this money as was needed should be used to remove a bar around Seaford in the Nanticoke River. Consequently, the Corps of Engineers suboffice in Wilmington contracted for dredging the bar to make the waterway 100 feet wide and nine feet deep for a distance of 8,000 feet. By June 1899, a channel of such dimensions existed from Seaford to the Maryland state line. "From what information I obtained from the Masters and Pilots of vessels trading to Seaford," the engineer inspector on the scene reported during that same month, "I find that they consider the river in good condition."[45]

To the south the Baltimore District of the Corps of Engineers performed more extensive renovations to the Wicomico River which flows from Salisbury, Maryland, into Chesapeake Bay. Salisbury was the central distribution point for lumber, cordwood, grain and fruits for Wicomico County and the entire lower Eastern Shore, but transporting these goods down river was impossible. The Wicomico River below Salisbury was crooked, narrow and shoaled, with only a few inches of water in some places at low tide. Only small sailing vessels could venture up river, and even they had to anchor two miles below

An 1871 survey map of the Wicomico River.—National Archives



Salisbury to avoid being mired in the river's muddy bottom. The produce shipped from Salisbury had to be carried over shoals at high tide in boats that drew no more than two feet. Compounding the difficulty were sawmills in the town which poured dust into the river. Considerable portions of the shoals were composed of water-soaked sawdust mixed with mud and sand. Despite complaints from the Corps of Engineers, not until after 1880 would the sawmills cease to deposit their waste in the river.[46]

In 1872 Congress first appropriated money for enlarging the Wicomico River below Salisbury. Dredging did not start immediately, however, but was delayed until property owners along the river fulfilled the local requirement of building dikes behind which the dredged material could be deposited to form artificial banks for the stream. The federal government supplied the money for local citizens to use in erecting the bulkheads. As Craighill reminded the residents of Salisbury in the spring of 1873, nothing would be done until the dikes were built as promised. Dredging without proper bulkheads would be pointless, because the river would refill with mud too quickly.[47]

Full-scale dredging began in 1875 although the Baltimore District Engineer found that many dikes had been poorly constructed, due he felt, to a lack of experience. Because he realized they required strengthening, he used $4,000 of the $5,000 appropriated in 1875.[48] By 1884, the federal government had spent $41,000 on the Wicomico and the citizens of Salisbury, at an additional cost of $22,000, supplemented this excavation by building a drawbridge and warf bulkheads and by doing their own dredging in both prongs of the river at the town. The Wicomico could now serve vessels that drew six and a half feet.

Dredging the Wicomico opened up steamboat communication to Salisbury and solidified that town's position as the largest population center on the Eastern Shore. In 1882, the Maryland Steamboat Company established a shipping route between Baltimore and Salisbury. For the first time, large quantities of perishable fruits and vegetables could be shipped quickly and cheaply from Salisbury to Baltimore. Dredging the Wicomico River freed the lower Eastern Shore from its extreme isolation. Lumber mills in the area prospered, shipping 12 to 14 million feet of wood at one third the former cost to Washington, Baltimore, Philadelphia and various points in New Jersey. Strawberries could now be transported in large quantities without spoiling to these same population centers. New wood and grain mills and a crate-and-basket factory sprang up in Salisbury to take advantage of the strategic trade route. Unfortunately, in October 1886 a fire destroyed most of these businesses, doing more than $700,000 worth of damage, and they had to be rebuilt.[49]

Dredging in the Wicomico River during 1885 caused an intense controversy over the dumping of the mud spoil. Previous dredging had filled the area behind the dikes to capacity and they were in a bad state of decay anyway. Merchants of Salisbury, who were actively interested in expanding the Wicomico channel, complained in April 1885 when the contractor simply dumped the spoil on the sides of the river. It was only a matter of time, they argued, before the action of passing steamers would wash the soft mud back into the stream. To remedy the condition, the Engineers managing the contract decided to use Ellis Bay, some twenty-four miles down river from Salisbury, as the dumping ground. But the distant deposit site slowed operations, twenty hours often being consumed to tow the scows to Ellis Bay and back. The use of Ellis Bay as a deposit site was short-lived. Watermen, charging that the dumping destroyed valuable oyster beds, were granted an injunction by the state's attorney that forbade the use of Ellis Bay or the flats of the Wicomico River as deposit areas. Later, the beleaguered contractor deposited spoil in a series of deep holes in the river, five or six miles below the work, for the rest of the job.[50] Further enlargement of the Wicomico during the 1890's encompassed dredging around various wharfs near Salisbury and deepening the channel in some places to nine feet.[51] By the end of the century, the marsh-banked Wicomico River had become one of the major transportation arteries of Maryland's Eastern Shore.

Other Corps projects during the nineteenth century on the southern Eastern Shore concerned dredging the Manokin and Pocomoke Rivers. The Manokin, a small tributary that flows to Princess Anne, has always been barely navigable. The dredging of the 1890's did little to remedy this

condition. The Manokin River project is a prime example of "pork-barrel" river and harbor legislation enacted to put money in a Congressman's district without concern for the work's feasibility or usefulness.

The Corps first surveyed the Manokin in 1888 in accordance with the requirements of the River and Harbor Act of that year. Corps Engineers examined the mud flats at the mouth of the river and estimated that it would cost $30,000 to dredge a channel six feet deep and 100 feet wide for three miles through these flats.[52] A civilian inspector of the Baltimore District, writing in 1905, believed that the Division Engineer and the Chief of Engineers privately opposed the project, but that Representative Charles H. Gibson of Queen Annes County influenced them and his colleagues to get an appropriation from Congress.[53] Whether or not this was true, the dredging of the mud flats proved singularly unsuccessful—a futile exercise which benefited no one.

An appropriation of $7,500, authorized in September 1890, started the excavation. Further appropriations in 1892, 1894, 1896 and 1899 kept the dredges at work throughout the decade in excavating massive quantities of thick, sticky, blue mud and depositing it on the side of the river. Every year when the dredges returned to resume work the mud flats had refilled. In 1899, the assistant engineer at the site, when he arrived for a new work season, found that "the bank of dredged material thrown up during former operations had disappeared entirely" having washed back into the river. The channel previously dredged to a depth of six feet now showed a depth of only four. "The soft mud had run back from the banks," the assistant engineer informed his superior, "and the heavy storms from the southwest had hastened the work of leveling the bottom of this broad but shallow expanse of water." The contractor spent most of the summer redredging. Little new work could be completed.[54]

The channel required constant dredging to prevent the mud flats refilling. However, there was not enough traffic on the river, even when the flats were open, to justify the expense. An assistant engineer, writing in 1905, recalled the experience of Col. William P. Craighill when he rode on the Manokin from Princess Anne to Deals Island some years earlier while he was Southeast Division Engineer and Baltimore District Engineer. Craighill found not one other passenger, package or letter on the boat with him.[55] In 1905, the Baltimore District Engineer, Lt. Col. Richard Hoxie, called continued dredging on the Manokin River "not justified by the interests involved."[56] The project had been dubious from its inception.

The Pocomoke is the southernmost river on Maryland's Eastern Shore. It passes through the small towns of Snow Hill, Shad Landing and Pocomoke City and into Pocomoke Sound in the Virginia area of the Eastern Shore. The section between Shad Landing and Snow Hill is bordered by a dense wilderness of tulip poplar, maple, pine, dogwood and cypress.[57]

Although mud shoals also made trouble for engineers on the Pocomoke, the solution would have to wait until the twentieth century. Dredging during the nineteenth century came in three spurts during 1879-80, 1887-88 and 1896-97 and involved widening, the whole channel, trimming off sharp angles, and removing stumps, logs and other obstructions. The residents of Pocomoke City hoped that these improvements to the river would make their town as important as Salisbury, but this was never to be. Nevertheless, after the dredging, farmers from the area could ship perishable produce down stream with less risk of being grounded or running into a sunken stump.[58]

All up and down the Eastern Shore during this period dredges were contracted by the Corps, and Corps engineers surveyed streams, creeks and harbors. Major waterways such as the Choptank, Chester and Wicomico Rivers were not the only ones to draw attention. At Crisfield harbor, off the Little Annemessex River on the southern shore, in 1876 the Corps spent almost $40,000 dredging a twelve foot deep channel across a bar that blocked the entrance to the town's wharves.[59] On the Warwick River, just above Cambridge, operations included dredging a channel 4,400 feet long to connect it with the Choptank River.[60] Just north of the Warwick, on the La Trappe River, the Corps during 1894-95 dredged a channel 150 feet wide and eleven feet deep across a bar at the mouth of the stream and a waterway seventy five feet wide and eight feet deep to Trappe Landing at the head of navigation.[61]

Other Corps projects on Maryland's Eastern Shore during the last three decades of the nineteenth century included dredging at the town of Centreville on Corsica Creek, a tributary of the Chester River,[62] and in the Northeast River, on the upper Western Shore above the Potomac River. Craighill was never particularly sanguine about the merits of the Northeast River project. On an inspection during April 1893 he noted some filling of the dredged cut, but the "most noticeable thing . . . was the absence of any commerce needing dredging to the depth of 6 feet."[63] At Rock Hall harbor, in the upper shore, at the nearest point on the Eastern Shore to Baltimore, the Corps during 1897-98 dredged a ten foot deep channel for about a mile from the town into Chesapeake Bay. Sailing boats and a steamer of the Chester River Steamboat Company that made round trips to Baltimore plied the waterway. Watermen were never happy with the dredging, complaining that the excavated mud was always being dumped on oyster beds. The civilian inspector at the site maintained that the dredging had not destroyed any oysters. United States agent William F. Smith investigated the dumping of spoil at Rock Hall and agreed with the inspector. The Secretary of War, commenting on Smith's report, concluded that "it appears that the present arrangements for dumping are the very best obtainable, and that the complaint is hardly justified by existing conditions."[64]

The Baltimore *Sun* praised the Government's improvement of Rock Hall harbor for aiding navigation well as fishing. It reported that since the cutting of a channel from Rock Hall to deep water in Chesapeake Bay, through which the current moves rapidly, "the crabs and fish have been more abundant, and it is no uncommon thing to ship fifty to one hundreds barrels of crabs to Baltimore daily. Thousands of bushels of oysters are tonged daily."[65] Nevertheless, the protest by watermen of the Rock Hall area persisted into the twentieth century.

Finally, on the other side of the Chesapeake Bay, at Annapolis, there was minor dredging during the summer of 1886 to remove bars near the entrance of the harbor. This would benefit navigation for vessels employed in instructing the midshipmen at the Naval Academy. It was only a small-scale project that cost $10,000, because as Craighill observed, "The commercial importance of this harbor is quite small."[66]

VI

While the Baltimore District of the Army Corps of Engineers was engaged in internal improvements from its early history, it is only after 1870 its activities in civil works can be described as massive. From 1870 to the Spanish American War, the Baltimore Engineers at one time or another changed the landscape of waterways in Virginia, North Carolina and West Virginia, but most extensively in Maryland.

The most dramatic change occurred on Maryland's Eastern Shore where the Corps advanced navigation between that geographically isolated area and Baltimore. With today's modern roadways and bridges that now span Chesapeake Bay, water communication between the Eastern Shore and the western side of the bay seems not so important. But during the nineteenth century the dredging of waterways opened new markets for Eastern Shore produce and allowed cheaper and more efficient transportation than nineteenth century railroads on the Eastern Shore could furnish. Not all of these ventures were wise from an engineering or economic point of view. There was a lack of planning with projects being adopted piecemeal. But for the farmers of the Eastern Shore, these channel excavations meant a broadening of their commercial horizons.

Footnotes to Chapter V

[1]Isaac Lippincott, "A History of River Improvement," *Journal of Political Economy*, XXII (Jul 1914), pp. 630-60.

[2]H. F. Raup, "The Susquehanna Corridor: A Neglected Trans-Appalachian Route," *Georgraphical Review*, XXX (Jul 1940), p. 440.

[3]Ltr Capt Henry Brewerton to Brig Gen Joseph Totten, C of Engrs, 22 Feb 1853. Rec Gp 77, entry 968, vol. I.

[4](1) Ltr, Brewerton to Col Sylvanus Thayer, 12 Oct 1858. Rec Gp 77, entry 968, vol. II. (2) Ltr, Lt Cyrus B. Comstock to Col Rene E. De Russy, 6 Sep 1859. Rec Gp 77, entry 968, vol. III.

[5]Ltr, Maj William P Craighill to Maj Gen Andrew A. Humphreys, 4 Sep 1866. Rec Gp 77, entry 968, vol. III.

[6]*Ibid.*, 4 Jun 1867. Rec Gp 77, entry 968, vol. V.

[7]Ltr, Col John H. Simspon to Humphreys, 1868. Rec Gp 77, entry 968, vol. V.

[8]*Ibid.*, 7 Oct 1869. (2) Ltr, Craighill to Humphreys, 11 Sep 1871. Rec Gp 77, entry 968, vol. VII. (3) Annual Rpt, C of Engrs, 16 Oct 1880, p. 99.

[9]Ltr, Craighill to J. W. Stump, fisherman, 15 Apr 1871. Rec Gp 77, entry 969, vol. II.

[10]Ltr, Craighill to Maj Gen H. G. Wright, C of Engrs, 17 Jan 1880. Rec Gp 77, entry 969, vol. V.

[11]Annual Rpt, C of Engrs, 13 Oct 1883, p. 132.

[12]Ltr, U.S. Agent William F. Smith to Brig Gen Thomas L. Casey, C of Engrs, 17 Apr 1895. Rec Gp 77, entry 1040, vol. XX.

[13]Ltr, Craighill to Brig Gen James C. Duane, C of Engrs, 31 Dec 1887. Rec Gp 77, entry 981.

[14]Maizie H. Johnson, "Preliminary Inventory of Textual Records of the Office of the Chief of Engineers," Nat Archives, Rec Gp 77, pt. 2, Recs of Engr Divs and Dists, (Nat Archives, 1965), pp. 45-46.

[16]*Ibid.*, 31 Aug 1876. Rec Gp 77, entry 968, vol. VIII.

[17]Annual Rpt, C of Engrs, 29 Sep 1896, p. 140.

[18]*Ibid.*, 16 Oct 1880, p. 106.

[19]*Ibid.*, 20 Oct 1879, p. 79; 16 Oct 1885, p. 286.

[20]Ltr, Col Peter C. Hains to Maj James F. Gregory, CE, Cincinnati, Ohio, 1 May 1897. Rec Gp 77, entry 984, vol. XV.

[21](1) Ltr, Craighill to Humphreys, 31 Aug 1876. Rec Gp 77, entry 968, vol. VIII. (2) Annual Rpt, C of Engrs, 16 Oct 1885, p. 286.

[22]Annual Rpts, C of Engrs, 21 Oct 1876, p. 65; 16 Oct 1880, p. 110; 13 Oct 1883, p. 147.

[23](1) De Gast, *Lighthouses of the Chesapeake* p. 1. (2) L. C. Gottschalk, "Effects of Soil Erosion on Navigation in Upper Chesapeake Bay," *Geog Rev*, XXXV (Apr 1945), p. 222.

[24]Ltr, Craighill to Humphreys, 15 Oct 1872. Rec Gp 77, entry 969, vol. III.

[25]Edward L. Pross, "A History of Rivers and Harbors Appropriation Bills, 1866-1933." Unpublished Ph.D. dissertation, Ohio State Univ., 1938, pp. 43-60.

[26]Ltr, Craighill to Humphreys, 15 Sep 1876. Rec Gp 77, entry 968, vol. VIII.

[27]Annual Rpt, C of Engrs, 20 Oct 1871, app. Q9, p. 613-14.

[28]Ltr, Craighill To Humphreys, 30 Apr 1873. Rec Gp 77, entry 969, vol. III.

[29](1) Annual Rpt. C of Engrs, 16 Oct 1880, p. 100. (2) Ltr, Asst Engr George Miller to William F. Smith, 17 Jun 1897. Rec Gp 77, entry 994.

[30]Annual Rpt, C of Engrs, 22 Oct 1871, app. Q10, p. 616.

[31]Ltr, Craighill to Dr William H. Hayward of Cambridge, 8 Apr 1873. Rec Gp 77, entry 969, vol. III.

[32]Ltr, Craighill to Humphreys, 28 Apr 1873. Rec Gp 77, entry 969, vol. III.

[33](1) Ltr, Craighill to Thomas E. Wright and James Wallace of Cambridge, 8 Aug 1872. (2) Ltr, Craighill to W. Wilson Byrn of Cmbridge, 7 Oct 1872. (3) Ltr, Craighill to Humphreys, 8 Oct 1872. Rec Gp 77, entry 969, vol. III.

[34]*Ibid.*, 4 Apr 1878. Rec Gp 77, entry 969, vol. IV.

[35]Annual Rpt, C of Engrs, 28 Sep 1895, p. 146.

[36]Ltr, E. S. Johnson, Pres, Choptank Steamboat Co., to William F. Smith, 13 Dec 1886. Rec Gp 77, entry 1041, box 1.

[37]William F. Smith, Rpt on Choptank River Project Since 1880, (Jul 1894). Rec Gp 77, entry 1040, vol. VII.

[38]Annual Rpts, C of Engrs, 22 Oct 1874, p. 81; 18 Oct 1875, p. 86; 21 Oct 1876, p. 63; 12 Oct 1877, p. 57; 20 Oct 1879, p. 75; 16 Oct 1880, p. 101.

[39]Ltr, Craighill to William F. Smith, 27 Nov 1891. Rec Gp 77, entry 994, box 2.

[40]Ltr, Asst Engr George Miller to William F. Smith, 29 Dec 1899. Rec Gp 77, entry 994, box 2.

[41]Ltr, Craighill to Wright, 13 Jan 1883. Rec Gp 77, entry 969, vol. VI.

[42]Ltr, Craighill to G. H. Ferris, 28 Oct 1881. Rec Gp 77, entry 969, vol. VI.

[43](1) Ltr, Asst Engr William Proctor Smith to William F. Smith, 20 Feb 1885. Rec Gp 77, entry 1041, box 1. (2) Annual Rpt, C of Engrs, 13 Oct 1883, pp. 132-33.

[44]William F. Smith, Rpt on Elk River, Jun 1891. Rec Gp 77, entry 1040, vol. XI.

[45](1) William F. Smith, Rpt on Nanticoke River, 30 Jun 1897. Rec Gp 77, entry 1040, vol. XVII. (2) Ltr, Inspector C. M. Bird to William F. Smith, 9 Jun 1899. Rec Gp 77, entry 994, box 6.

[46](1) Annual Rpt, C of Engrs, 16 Oct 1880, p. 104. (2) Rpt on Wicomico River, 1884. Rec Gp 77, entry 994, box 6.

[47]Ltr, Craighill to Humphreys, 7 Apr 1873. Rec Gp 77, entry 969, vol. III. (2) Annual Rpt, C of Engrs, 20 Oct 1873, p. 73.

[48]Ltr, Craighill to Humphreys, 7 Apr 1875. Rec Gp 77, entry 969, vol. IV.

[49](1) Ltr, Govt Inspector George W. Parsons to William F. Smith, 28 Dec 1886. Rec Gp 77, entry 1041, box 1. (2) The president of the Maryland Steamboat Co. wrote in 1886 that "the dredging of the Wicomico near and at Salisbury, has been the means of opening steamboat communication with that place, and has

reduced the freight on the Rail Road by reasons of steamboat competition . . . and has also been the means of largely increasing the business of the place." Ltr, Howard R. Ensign, Pres, Md. Steamboat Co., to William F. Smith, 13 Dec 1886. Rec Gp 77, entry 1041, box 1.

[50]Ltr, George Parsons to William F. Smith, 24 Mar 1885. (2) Ltrs, Inspector Alex Q. Hasson to Asst Engr Col William P. Smith, 9, 17, 23 and 27 Apr 1885. (3) Ltr, Thomas Rider, Md St Atty to Brig Gen John Newton, C of Engrs, 11 May 1885. (4) Ltr, Col. William P. Smith to William F. Smith, 30 Jul 1885. Rec Gp 77, entry 1041, box 1.

[51]Ltr, William F. Smith to Craighill, 15 Sep 1896. Rec Gp 77, entry 1040, vol. XXII.

[52]Ltr, William F. Smith to Brig Gen Thomas L. Casey, C of Engrs, 1 Aug 1892. Rec Gp 77, entry 1040, vol. XIV.

[53]Ltr, Inspector John R. Beckett to Lt Col Richard L. Hoxie, Baltimore Dist Engr, 20 Oct 1905. Rec Gp 77, entry 994, box 5.

[54]Ltr, Asst Engr George Miller to William F. Smith, 2 Aug 1899. Rec Gp 77, entry 994, box 5.

[55]Ltr, Beckett to Hoxie, 20 Oct 1905. Rec Gp 77, entry 994, box 5.

[56]Quoted in Ltr, Actg Sec War Robert Shaw Oliver to Levin L. Waters of Princess Anne, Md, 6 Nov 1905. Rec Gp 77, entry 994, box 5.

[57]William T. Stone and Fessenden S. Blanchard, *A Cruising Guide to the Chesapeake*, rev. ed. (New York: Dodd, Mead & Co., 1973), p. 243.

[58]Ltr, 21 citizens of Pocomoke City to William F. Smith, 29 Jun 1888. Rec Gp 77, entry 994, box 10.

[59]Annual Rpt, C of Engrs, 21 Oct 1876, p. 64.

[60]Ltr, V. Murray Sulivane to William F. Smith, 29 Mar 1893. Rec Gp 77, entry 994.

[61]Ltr, William F. Smith to Gen Thomas L. Casey, C of Engrs, 25 Aug 1894. Rec Gp 77, entry 1040, vol. XIII.

[62]Annual Rpt, C of Engrs, 13 Oct 1883, p. 134.

[63]Letter, Craighill to William F. Smith, 29 Apr 1893. Rec Gp 77, entry 994, box 6.

[64](1) Ltr, watermen to Collector of Port of Baltimore, 14 Jun 1897. (2) Ltr, Beckett to William F. Smith, 24 Jun 1897. (3) Ltr, Sec War Russell A. Alger to Sec of Treas Lyman J. Gage, 12 Jul 1897. Rec Gp 77, entry 994, box 10.

[65]Baltimore *Sun*, 18 Nov 1898. Rec Gp 77, entry 994, box 11.

[66]Ltr, Craighill to Brig Gen John Newton, C of Engrs, 4 Jan 1886. Rec Gp 77, entry 994, box 1.

Chapter VI
Structures for Defense in the Aftermath of the Civil War

In the days after 1865, Congress appropriated only token sums for seacoast fortifications in the Baltimore area. Work on the armed structures was confined mostly to repairing leaky roofs, broken walls, decaying bridges and wharfs, sodding and painting.

Although the site of old Fort McHenry at the entrance to Baltimore's inner harbor had lost much of its importance because of the growth of the city outward on the Patapsco River towards Chesapeake Bay, the Baltimore District Engineer, Maj. William P. Craighill, still thought it should be occupied by a battery of heavy guns. No dependence could be placed on historic Fort McHenry, however; consequently, a new battery needed to be constructed.[1]

In the years immediately following Lee's surrender at Appomattox, the Corps of Engineers began minor repairs to McHenry's original structure. During 1869, Col. John H. Simpson improved the fort's drainage system by having the main ditch lined with metal to protect against erosion. Also, he saw that the brick hoods of the magazines were lengthened to protect their doors from rain.[2] After Craighill's return the next year, work began on detailed drawings of a large exterior water battery which he felt was mandatory. By 1873 construction on the battery finally was under way. Located on the northeast corner of the reservation near the seawall on about the same site where the lower earthwork had stood during the War of 1812, the entrenchment was to be large enough to accommodate twenty-five 15-inch guns.

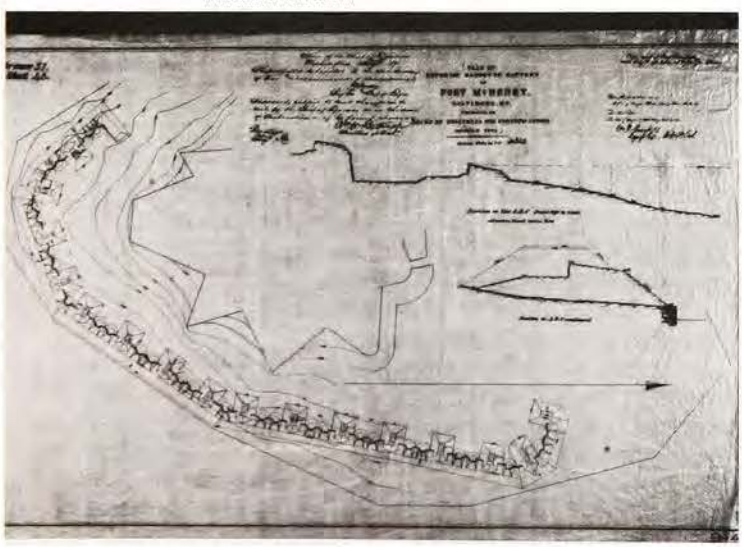
Between 1873 and 1875, Craighill supervised a large work force on the new earthen battery. They built the parapet and the heavy embankment for the terreplein, and did the concrete work on three magazines and the necessary drains. He spent every penny of the $45,000 Congress had appropriated. Accused of showing political favoritism by hiring mostly Irishmen and Democrats as laborers and foremen on the battery project, Craighill vehemently denied the charge. He did so by admitting that politics did influence hiring practices, but that he favored Republicans over Democrats. "I am not a politican," he noted, "but it is my opinion that the administration party should always have the preference on U.S. work." Since the current administration was Republican, active Democratic politicians in influential positions should be discharged. "Republicans shall have the preference in all U.S. work under my supervision," Craighill concluded, "with the understanding, of course, that every man is to do a fair, honest day's work, for a day's wages. We are to have no idlers or shirkers."[3]

By 1876, three traverse magazines, the terreplein and a parapet large enough for ten guns had been completed. But a lack of funds forced the army to suspend all further construction. The Corps never completed the battery, and incessant pleas for money failed.[4] Although Craighill acknowledged McHenry's

declining importance as a seacoast fortification, he remained adamant in his support for the battery. Rioting in Baltimore during the national railroad strike of July 1877 reinforced his conviction that the federal government should at least maintain the facilities at McHenry to house a garrison strong enough to preserve order in the city. Craighill wrote that the disturbances in Baltimore in July, when troops confronted strikers protesting a ten percent wage cut by trying to tie up the Baltimore and Ohio Railroad, "will probably be a sufficient proof of the advantages of having quite near the city at all times a garrison of several hundred U.S. regular troops."[5]

But there was strong pressure on the federal government to relinquish the strategically located McHenry reservation to waterfront commercial enterprises. An act of Congress of 19 June 1878 did give a portion of the Fort McHenry tract to a dry-dock company on the corner of the site nearest the city.[6] Craighill still hoped that the army would retain control over the rest of Fort McHenry unless another suitable site could be found to house a peace force for Baltimore and a heavy battery of guns. The belief that Fort McHenry was no longer of any use to the federal government, Craighill said in 1885, was "an erroneous judgement." Should an enemy's smaller vessels penetrate Baltimore's outer barrier, McHenry would be valuable.

Proposed plan for a large exterior water battery at Fort McHenry.—National Archives



Again he returned to the theme of domestic tranquility by reminding the Chief of Engineers that "It was . . . found very convenient in the riots of 1877 to call upon the regulars from Fort McHenry."[7]

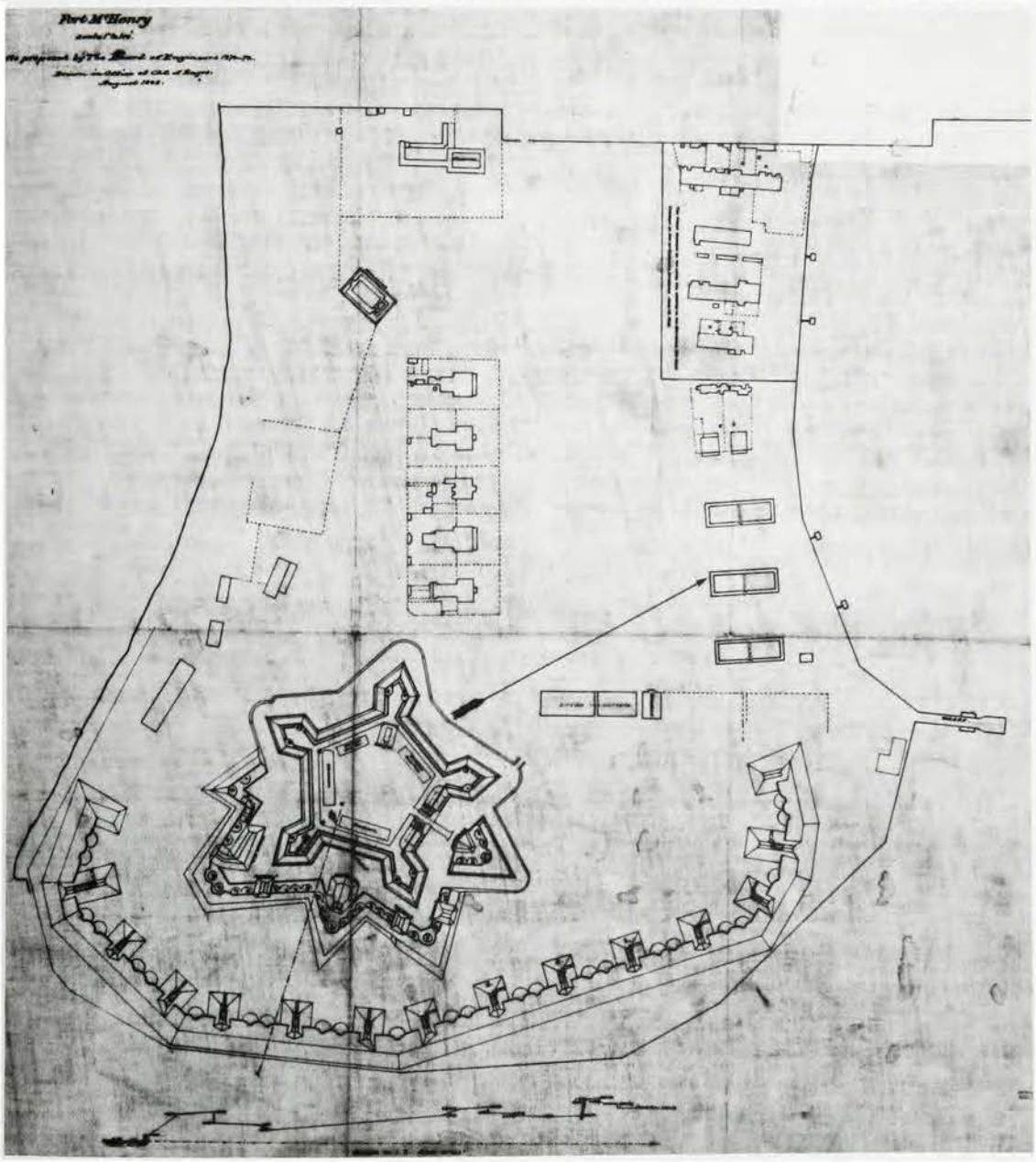
The federal government retained Fort McHenry but began no new work on the historic old structure. The only activities of

Proposed batteries for the Baltimore Harbor and their estimated arcs of fire, 1871.—National Archives

the Corps of Engineers on the reservation were maintenance and repairs. For example, Craighill reported that during fiscal year 1886 the Corps mowed the slopes of the main work and the exterior batteries at McHenry, cleaned out and readjusted some of the drains and replaced broken slates on the large storage magazine.[8]

The elements, however, plagued Fort McHenry. Heavy rainfall during May and June 1888 caused the unfinished battery of the 1870's to slide three feet into the outer seawall. A severe storm of 31 May 1889 further damaged the seawall.[9] A gale on 28 August 1893 totally smashed the wharf at the fort, rendering it useless. [10] A torrid down-

An outline of the Fort McHenry Military Reservation as proposed by the Board of Engineers for Fortifications in 1871.—National Archives



pour on 13 October of the same year extensively eroded the unprotected slope between the end of the old sea wall and the western boundary of the grounds, especially at the rear of the cemetery. "The grave of one officer was uncovered," Craighill reported, "and it was necessary to remove and rebury the remains."[11]

After all of this damage, Fort McHenry required more repairs than funds would allow. Growing numbers of people visited the fort each year because of its historic interest. For this reason alone, Craighill felt the fort should be put in decent condition and kept that way. He was embarrassed by the appearance of the fort which he termed "disreputable."[12] Annually Craighill inspected Fort McHenry and made a long list of damage and the repairs needed, but he lamented that he received very little money to do anything. "But some day I may make a big haul," he wrote optimistically to the commander of the fort, "if I keep on pulling."[13]

Between 1894 and 1896, contractors, bothered by high tides and inclement weather, did rebuild a 227 feet long portion of the seawall in the back of the cemetery and in the rear of the reservation for a length of 808 feet. But as Craighill's successor, Col. Peter C. Hains, observed in 1895, "with an annual appropriation of only $45,000 for the preservation and repair of all fortifications on the coasts of the United States, . . . little progress can be made on work that the Engineers regard as necessary to put Fort McHenry in a *respectable* condition."[14]

During the late nineteenth century other irritations hindered the Engineers efforts to preserve Fort McHenry. In 1878, Craighill complained that the Quartermaster Department erected and tore down buildings at Fort McHenry without notifying the Engineer Department. "It sometimes seems to me," Craighill wrote dispairingly, "the we are letting our privileges as military Engineers slip away altogether."[15] Periodically he denounced officers at the fort for allowing cows to wander about the reservation, especially in the mud after heavy rains, sometimes doing several hundred dollars' worth of damage. He became particularly vexed in the spring of 1876 with the commander at the fort, Brevet Maj. Gen. William Henry French. French was alleged to be a heavy drinker, and Craighill sought to have him relieved. During an inspection tour the Baltimore District Engineer found that the general's own cow was one of those which damaged the rolling sod hills of the old water battery. "When he is drunk, which is about all the time," Craighill informed the Chief of Engineers, "he is practically crazy. He is certainly not fit to be in

The magazine at Fort McHenry, ca. 1905. Quartermaster Department.—National Archives

command anywhere." Later in his frank letter to his superior Craighill called General French an "absurd ass."[16]

When Craighill visited incomplete, deserted Fort Carroll on 16 March 1889, he found the ordnance sergeant drunk. The sergeant and the lighthouse keeper were the only permanent residents of the island, and apparently passed the time by drinking together. The incident caused the sergeant's dismissal and his replacement by a watchman employed by the Engineer Department.[17]

II

Like Fort McHenry, Fort Carroll continued to stagnate during the three decades after the Civil War. It remained an unfinished, decaying work standing uselessly out in the middle of the Patapsco River. Only its lighthouse was of any value. Craighill urged the fort's completion, but to no avail. In 1878 the Board of Engineers for Fortifications recommended a radical modification of the original structure in order to enable it to hold the heaviest modern rifled guns, protected by armor thick enough to be impervious to naval bombardment. According to the new plan, those guns in casemates would be arranged in a single tier behind iron shields; those in barbette would be placed singly between traverses behind earthen parapets. Craighill termed Fort Carroll's completion "indispensable to the safety of the rich city of Baltimore." "It will require several years and liberal appropriations to accomplish," Craighill noted in 1882, "and it should be commenced without delay." Apparently few supported his view. Nothing was done except stopgap repairs to prevent total deterioration.[18]

By 1890, although Craighill still advocated transforming Fort Carroll from a stone work to one of iron and earth and armed with the best modern guns and mortars, he did admit that "the main defence of Baltimore should be at a greater distance from the city than the line of which Fort Carroll would be a part."[19]

III

Throughout this entire period Craighill felt completely frustrated in his efforts to improve Baltimore's defenses. During some years he had difficulty getting enough money for even essential repairs. In August 1886, he was forced to dismiss all his "fort-keepers" because Congress made no appropriations for preserving and repairing any fortifications. The allotment for maintaining batteries around Baltimore for fiscal year 1891 totaled only $1,410.[20] All of Craighill's admonitions about the urgency of strong seacoast defenses were ignored. He seemed to be carrying on a one-man losing crusade. He deplored the tendency of some members of Congress always to begin economizing by reducing the pay and the number of army officers. "I believe there is no class of men in the service of the government," he informed Representative James H. Platt, Jr., of Virginia, "who more faithfully and honestly and economically do their duty than the officers of the army."[21]

The Baltimore District Engineer sharply criticized the Washington correspondent of the Baltimore *Sun* who wrote that since war was remote and naval armament improved, old stone forts were now obsolete. "At this time," Craighill declared to the editor of that newspaper, "we have neither ships nor forts to defend our coast and cities. We should certainly have one or both."[22]

The next day a Baltimore *Sun* editorial supported Craighill and chastised Congress for appropriating only $100,000 to preserve all seacoast defenses while other nations were spending millions. The paper could not understand why our major commercial cities should be defenseless.[23]

Several months later, in a published letter to the editor, Craighill reiterated his advocacy of a strong national defense. "Let us build permanent forts, prepare our heavy guns and arrange our torpedoes for defense," he urged the public. While a powerful navy was essential to meet the enemy on the ocean, it was no substitute for a solid battery of guns on shore. "The fact that other nations know we are prepared for war would go far to avert it," Craighill concluded, "and thus insure us against it."[24]

Of course, the United States had the strategic advantage in the Western Hemisphere, and the protection afforded by the British navy and the balance of power in Europe made the nation relatively secure. In an 1881 letter to a friend in Baltimore, Craighill exaggerated the weakness of the United States when he wrote that the nation would be "helpless to resist the attack of even a 3rd or 4th rate power" and that the Atlantic coast

was "almost defenseless." He became intensely frustrated by what he viewed as an insufficient defense budget. "We do not need immense standing armies," he wrote, "but we do need coast defenses and a suitable navy neither of which can be made in a week or a month or a year. Even with plenty of money, time is necessary for their proper preparations and now we have no money."[25]

In 1883, Craighill detailed his proposals for the defense of Baltimore which included batteries beyond Fort Carroll along the Patapsco River. At North Point, at the junction of the Patapsco and Chesapeake Bay, Craighill called for a battery of heavy guns and mortars. The United States already owned seven acres of land here. Across the river, on the south side at Bodkin Point, he envisioned a similar structure that would subject enemy vessels to cross fire. If enemy warships passed this outer line, he hoped, batteries added at Rock Point, Hawkins Point, Sparrows Point and Fort Carroll would protect the city. Again this plan seemed to be only a dream, for few shared Craighill's concern about seacoast fortifications.[26]

While he realized the value of river-and-harbor projects, Craighill was anxious to be associated with purely military ventures. Although the District was busy with civil works, he sometimes despaired over the decline in military duties. "The Corps of Engineers, as part of the Army, are anxious to be engaged on useful *military* work, the construction of fortifications. Is there no way," he asked Representative Joseph Wheeler of Alabama, "in which there can be formulated and passed a *real* fortification bill?"[27]

IV

Craighill did take satisfaction from being in charge of readying the buildings and grounds at Yorktown, Virginia, for the centennial celebration of the surrender of Lord Charles Cornwallis in October 1881. Preparations began in July and entailed the construction of a large wharf, a reception building, a temporary camp for troops and a foundation for a monument.

Craighill's fear that the proliferation of "whiskey shops" in the area might cause rioting at the celebration did not materialize. The War Department commissioned the building of a Yorktown monument in 1883, and it was completed by the summer of the next year.

Although malaria infected Craighill and some of his labor force, everything was finished and decorated in time for the ceremonies.[28]

V

William P. Craighill left Baltimore in May 1895 to become Brigadier General and Chief of Engineers, a post he held for two years before retiring. No other Corps of Engineers officer served in the District as long, before his time or since.

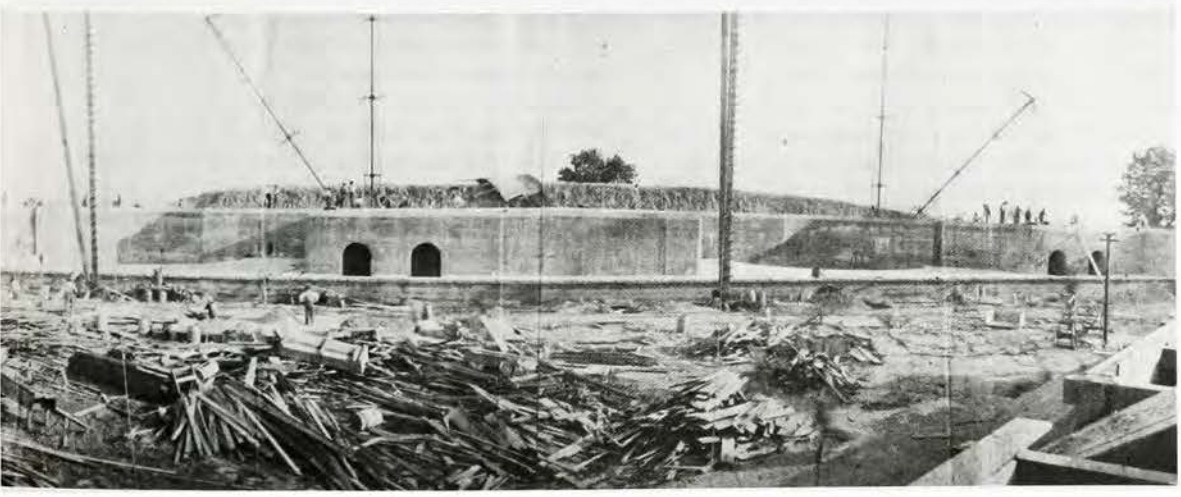
Coincidentally, the time of his promotion did mark an upsurge in funds spent on seacoast fortifications. By the mid-1890's, the U.S. traditional policy of shying away from involvement in the internal affairs of other nations seemed to be wavering, particularly in regard to Cuba. As pressures mounted for the United States to become instrumental in dismembering the Spanish empire, so did renewed preparations begin to strengthen fortifications on the Atlantic coast.

As early as 1893, the Board of Engineers on Fortifications outlined an elaborate defense plan for Maryland's most important commercial port. It recognized Baltimore's extensive growth and, echoing Craighill's sentiments of earlier years, it called for a line of defense far out in front of Fort Carroll. Specifically, the Board envisioned construction of new batteries at Fort Carroll, Hawkins Point, North Point and Rock Point. It estimated that the

Armaments in the first tier at Fort Carroll at the end of 1897.— National Archives

Hawkins Point during construction of gun emplacements in the spring of 1898. U.S. Army Corps of Engineers—National Archives.

Workmen on the mortar battery at North Point, November 4, 1897, June 30, 1898. U.S. Army Corps of Engineers.—National Archives



After the Spanish—American War, the mines planted in Baltimore Harbor were detonated by the Army underwater. U.S. Army Corps of Engineers.—National Archives

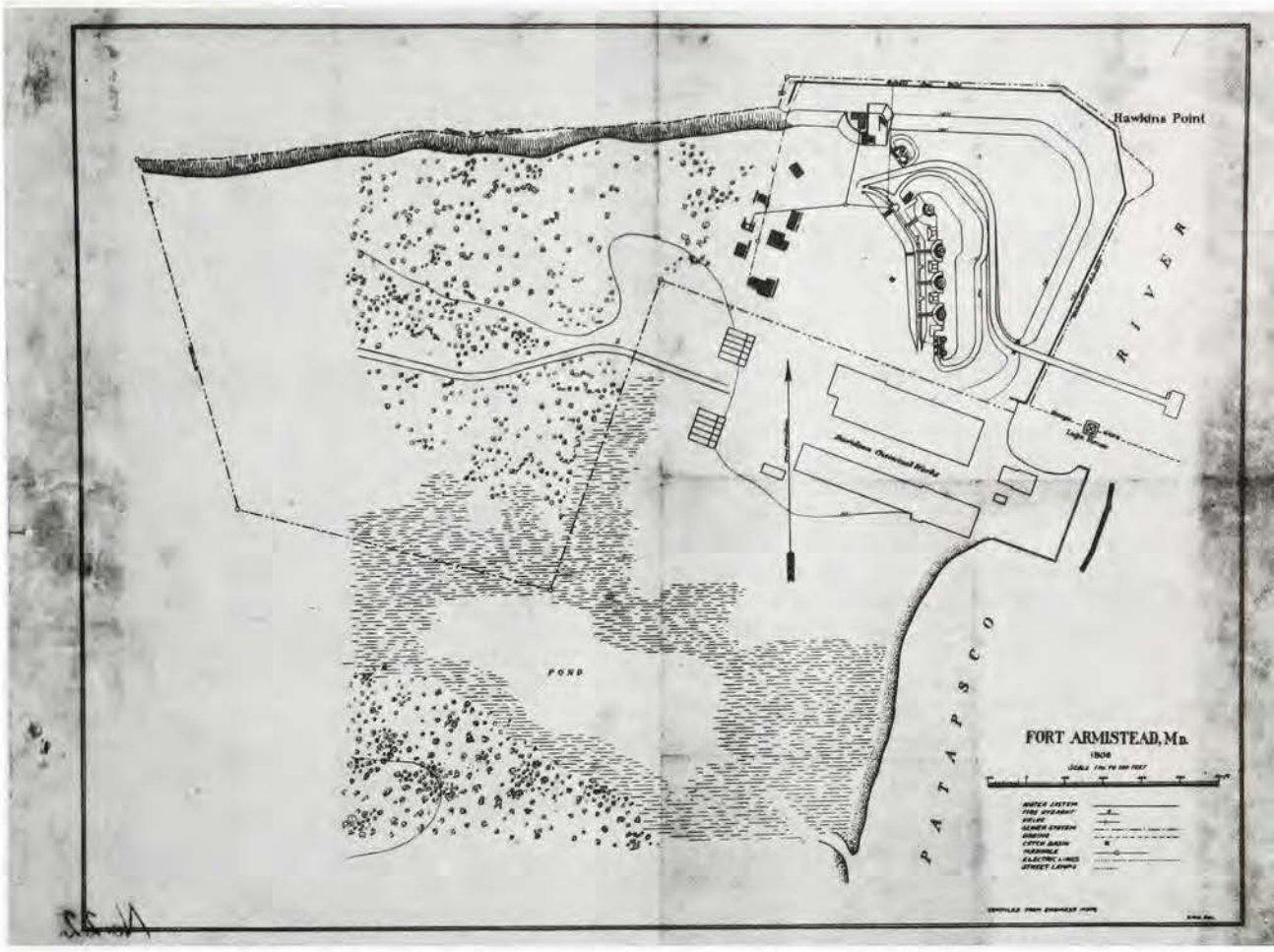
entire fortifications package for Baltimore would cost at least $1.75 million.[29]

While the Secretary of War approved the Board's recommendations in early 1894, no funds became available for acquiring sites. However, in 1896 Congress appropriated the largest sum for fortifications ever known in the history of the country to that time. Work began immediately around Baltimore on batteries at four sites designated by the Board. Col. Peter C. Hains, a Civil War veteran with wide-ranging experience on many river-and-harbor projects, became District Engineer. He made some modifications in the Board's original 1893 outline by recommending an increase in the caliber of some of the guns to be emplaced at various batteries. For example, at Hawkins Point, Hains advised the use of 12-inch guns instead of 8-inch. At North Point and Rock Point he suggested an increase in the number of 12-inch guns from three to four, coupled with a reduction in the number of smaller weapons and mortars. Against light-draught vessels, Hains believed, mortar fire was useless. "Such vessels," he wrote Craighill, "would keep constantly in motion and the chance of hitting one with a mortar shell would be extremely small." Hains worried about the isolation of the battery at Rock Point and he warned of the need to protect it by "suitable field-works."[30]

The Secretary of War approved Hains' revisions, and construction began along those lines. Hains was confident that now Baltimore would be one of the best protected cities in the world. The acquisition of land, surveying and grading, and the pouring of concrete rushed forward in 1896 and 1897. But the approach of war with Spain in the spring of 1898 sharply quickened the pace of construction. By 15 March work was proceeding simultaneously at Hawkins Point and North Point with day and night crews. Under the emergency the army received an extra $50,000 to immediately construct two emplacements for 12-inch guns on disappearing carriages at North Point. The Chief of Engineers, Brig. Gen. John M. Wilson; hoped that the emplacements would be ready as quickly as possible. "The operations of the Engineers, Brig. Gen. John M. Wilson, hoped of results with the allotment made to it from the emergency appropriation for national, defense," he sternly warned the second lieutenant immediately in charge, "will be viewed by the entire country, and your reputation and that of the Corps of Engineers is involved in this matter."[31]

By April 1898, President William McKinley had decided to follow popular feeling and become responsible for leading the nation into war against Spain. With war practically upon the country, the Chief of Engineers lamented the lack of preparedness of previous decades. He urged the Baltimore District Engineer to "show what the Corps of Engineers can do when an emergency arises for which the country is unprepared."[32]

Despite the nation's unreadiness in 1898, the war with Spain was no great trial, and was over by July. The primary task of the Baltimore District Engineer during the



The battery at Hawkins Point, designated Fort Armistead, as it stood in 1908.—National Archives

emergency was to fortify the harbor against the remote chance of attack. Construction moved forward on the batteries along the Patapsco. By April the army had mounted three 8-inch high-power rifles at Hawkins Point. The parapet at that site was nearly finished and the platform on the left flank of this battery was now ready for the carriage of a 12-inch gun. At North Point laborers also completed two emplacements for 5-inch rapid-fire guns and a mortar battery. When the mortars arrived, Hains reported, the battery could be ready for service within a few days. Work was moving furiously on the two emplacements for the 12-inch guns, and Hains predicted that they would be ready in another month.[33]

During the next several months double shifts used every daylight hour on building these fortifications. By June, North Point had eight platforms ready for 12-inch mortars. The two emplacements for 12-inch high-power rifles were nearly finished. Three more 8-inch guns and one 12-inch rifle had been mounted at Hawkins Point, at Fort Carroll the construction of two emplacements for 12-inch guns had started.[34]

The most dramatic action by the Baltimore District of the Corps of Engineers during the War with Spain was the mining of Baltimore harbor. Preparations for such a contingency went back to 1896 when the Chief's office approved a plan for the submarine-mine defense of Baltimore. At that time the Chief of Engineers urged Colonel Hains to store the bulkier material as near as possible to the

minefield sites and for him and his officers to fully familiarize themselves with mining procedures so they could act hastily at the proper time.[35]

On 3 April 1898, General Wilson ordered Hains to plant the mines.[36] The official declaration of war was still eight days away. Although mines would protect the harbor, they would be placed only on the sides of the channel in order to keep shipping open. Planting of the mines began on 23 April and was completed by 12 May. The explosives were confined to the Fort McHenry division of the main channel to a point about half a mile below Fort Carroll. Hains had them arranged in two lines 400 feet apart on each side of the channel. The mines to block the middle of the channel were kept ready on the shore "to be promptly laid when danger is imminent—say after an enemy's fleet has arrived in the Chesapeake Bay."[37] To protect local commerce the lighthouse inspector buoyed the mined channel. The entire operation was shrouded in the utmost secrecy. The Chief of Engineers requested that special vigilance be exercised to guard against any efforts to tamper with the mines and he warned "that there exists in this country a body of men under Spanish control, organized for the special purpose of cutting the submarine cables of our principal harbors."[38] Fortunately, there was no tampering with the mines; neither had they been necessary for defense. By August, Spain was defeated and the Army ordered the mines removed. Since they were loaded with loose dynamite, it was deemed best to detonate them in the water.[39]

VI

During the years following the Spanish-American War work continued on building gun batteries to safeguard Baltimore. Now the United States had become a world power with global, commercial interests which needed a strong defense. By the spring of 1903, Hains noted that Baltimore was well fortified against an invasion from the sea. The structure on North Point, named Fort Howard in honor of Col. John Eager Howard, a citizen of Baltimore who had distinguished himself as leader of Maryland troops during the Revolutionary War, had six separate batteries armed with guns and mortars of all sizes. On Rock Point stood Fort Smallwood, named for Maj. Gen. William Smallwood, another Marylander who had served in the Continental Army. Fort Smallwood was armed with two 6-inch guns on disappearing carriages and one 15-pounder rapid-fire gun. The fort on Hawkins Point, designated Fort Armistead in honor of Brevet Lt. Col. George Armistead, who commanded Fort McHenry during its defense against the British assault in 1814, held four batteries with cannon of varying sizes. At Fort Carroll, 12-inch guns were mounted on the southeastern face of the old fort and were well protected by a thick parapet in front. Fort Carroll also had emplacements for two 5-inch guns and two 15-pounders.[40]

Although progress in erecting these batteries had been rapid, dampness in the magazines at Fort Howard and Fort Armistead continued to plague the engineers. Condensation made some of the magazines unusable at Fort Howard. Walls dripped and the floors became so wet that it was necessary to wear boots. Dripping from the ceiling was so constant that without a waterproof coat or mackintosh a visitor would become soaked in a few minutes.

In August 1899, the Engineers tried drying out the magazines by using two exhaust blowers installed at each end of the shot rooms in recesses made in the side walls. The blowers ran for ten hours a day for two weeks and the walls gradually dried. But during September a hot, humid, sultry day made the magazines as wet as they had been in their worst stage before the blowers were started.

Next, the Engineers tried an electric heater to alleviate the persistent dampness, but it was effective only if it ran constantly. After it was cut off, condensation reappeared. Finally, the Engineers decided to attempt to dampproof the magazines by covering their sides and roofs with asphalt. They brushed on three coats of hot asphalt and then restored the surface of the original ceiling by filling the space below the asphalt with cement. Laborers then built brick side walls with one inch of asphalt between the concrete wall and the new brick work. To prevent the asphalt from coming through the brick work the Engineers placed a felt strip on the inner side of the wall. The long process was completed when workers built an additional wall and ceiling composed of T-bars and plastered expanding

metal, leaving an air space of about three inches at the sides and ceiling.

Unfortunately, the plan failed. The roof still leaked, so the Engineers determined to alter procedures by abandoning the air space and pumping in hot asphalt in the ceiling into a space left above the concrete arch, through holes made for the purpose. Six months after pumping the asphalt, black fluid began oozing through the brickwork on all sides. In the east shot room at Fort Howard the Engineers installed a copper ceiling with galvanized iron gutters and downspouts stuck in the side walls leading to a drain under the floor. This eliminated leaking but condensation was as bad as ever. Boards composed of magnesia and asbestos inserted on the side walls stopped the condensation temporarily. But the boards warped and eventually became saturated with moisture.[41] After much experimental damp-proofing the Engineers had some success by applying hot paraffin to the concrete roof, side walls and floors of a wet plotting room.[42]

At Fort Armistead the Engineers endured similar trials in their efforts to solve the nagging problem of damp magazines. They even tried lining the side walls and ceilings with a rubberized paper. Water dripping from the roof dissolved this paper; it was taken down after three weeks. The damp-proofing method finally adopted by the District was to attach galvanized sheet iron to the ceilings with gutters discharging into downspouts leading to drains in the floors; cork-painting all exposed metal; applying hot asphalt to vertical faces of concrete walls; and caulking cracks with oakum and brushing linseed oil on all other exposed concrete surfaces.[43]

The most striking innovation in these fortifications during the early twentieth century was the electrification of all elements of harbor defense. In the Baltimore area this meant installing power plants, range finders and searchlights. The Engineers built battery-commander stations at each fort and power plants generated by gasoline engines.

In connection with joint military maneuvers in June 1905, the engineers installed four searchlights: two at Fort Howard and one each at Forts Armistead and Smallwood. The lights were new and defects arose during the joint exercises. The field coils of the motors on all the lights had to be replaced due to defective insulation. The maneuvers also pinpointed other weaknesses in the fortifications network such as faulty ammunition lifts, bad wiring and the need for wider loading platforms.[44]

In general, Baltimore was well defended. Besides, war seemed to be a thing of the past. The best of all possible worlds had arrived. Tragically, in fewer than ten years the Western world would be plunged into an orgy of destruction from which it has never completely recovered.

Footnotes to Chapter VI

[1]Maj William P. Craighill, Rpt on Ft McHenry, 30 Jun 1876. Rec Gp 77, entry 997, vol. I.

[2]Ltr, Col John H. Simpson to Brig Gen Andrew A. Humphreys, C of Engrs, 7 Oct 1869. Rec Gp 77, entry 968, vol. V.

[3]Ltr, Craighill to J. H. Minnick of Baltimore, 16 Aug 1873. Rec Gp 77, entry 977, vol. I.

[4](1) Rpts by Craighill, 20 Jul 1874 and 30 Jun 1876. Rec Gp 77, entry 977, vol. I. (2) Erwin N. Thompson and Robert D. Newcomb, "Historic Structure Report, Fort McHenry" (Denver Service Center, Historic Preservation Team, Dept of Interior, Nat Park Serv), May 1974, p. 75. MS in Ft McHenry library.

[5]Ltr, Craighill to Humphreys, 23 Jul 1877. Rec Gp 77, entry 977, vol. I.

[6](1) Ltr, Craighill to Brig Gen Horatio G. Wright, Actg C of Engrs, 29 Apr 1879. (2) Rpt by Craighill, 30 Jun 1880. Rec Gp 77, entry 977, vol. I.

[7]Rpt by Craighill, 30 Jun 1885. Rec Gp, entry 977, vol. II.

[8](1) *Ibid.*, 30 Jun 1886. (2) The Chief of Engineers, Brig Gen John M. Wilson, in November 1884 ordered Craighill to use $3,245 on Fort McHenry during 1885 to make these renovations: repair the brick pavement and gutters inside the main work and sally port; repair the retaining walls; paint brick walls of the main work, bombproof traverses and magazines; fill in holes and sod over the exterior slope of the new water battery. Ltr, Wilson to Craighill, 20 Nov 1884. Rec Gp 77, entry 995, box 1.

[9](1) Ltr, Craighill to Brig Gen James C. Duane, C of Engrs, 16 Jun 1888. (2) Ltr, Craighill to Brig Gen Thomas L. Casey, C of Engrs, 17 Jun 1889. Rec Gp 77, entry 977, vol. II.

[10]Ltr, Henry M. Adams, Actg C of Engrs, to Sec War Daniel S. Lamont, 9 Sep 1893. Rec Gp 77, entry 995, box 1.

[11]Ltr, Craighill to Casey, 7 Dec 1893. Rec Gp 77, entry 977, vol. II.

[12]Ibid.

[13]Ltr, Craighill to Maj George B. Rodney, CO, Ft McHenry, 15 Nov 1893. Rec Gp 77, entry 977, vol. II.

[14]Ltr, Col Peter C. Hains to Engr Dept, 5 Nov 1895. (2) Rpt on Ft McHenry, 30 Jun 1895. Rec Gp 77, entry 977, vol. III.

[15]Ltr, Craighill to Lt Col H. G. Wright, 8 Oct 1878. Rec Gp 77, entry 977, vol. I.

[16](1) Ltr, Craighill to Casey, 6 Apr 1876. Rec Gp 77, entry 977, vol. I. (2) Gen French left Fort McHenry on 2 December 1876. If he was an alcoholic it is not part of the public record. He was known as a disciplinarian with sound military judgment. Cullum, *Biog Register*, vol. I., pp. 530-32.

[17](1) Ltr, Ord Sgt Patrick Mangan to Craighill, 16 Mar 1889. (2) Ltr, OTAG to Engr Dept, 22 Apr 1889. Rec Gp 77, entry 995, box 1. (3) Ltr, Craighill to Capt Silas Casey, USN, Lighthouse Inspector, 5th Dist, 26 Mar 1889. Rec Gp 77, entry 977, vol. VI.

[18]Rpts by Craighill for FY 1882 and FY 1884. Rec Gp 77, entry 977, vol. IV. (2) Repairs the Engineers made at Fort Carroll were similar to those undertaken at Fort McHenry during this period. In November 1884, the Chief of Engineers ordered Craighill to spend $1,007 during the next year at Fort Carroll, on such tasks as repainting, mending brick work, repairing roofs and rebuilding the temporary bridge between the wharf and sally port. Ltr, Wilson to Craighill, 20 Nov 1884. Rec Gp 77, entry 995, box 1. (3) In 1889 contractors repaired the temporary roof over the masonry on four faces of the fort, the bridge at the sally port, the roof of the ordnance sergeant's quarters, the lightning rods and two water tanks. They also built quarters for the watchman. Rpt by Craighill for FY ending 30 Jun 1889. Rec Gp 77, entry 977, vol. VI.

[19]*Ibid.*, 30 Jun 1890.

[20](1) Ltr, Wilson to Craighill, 6 Aug 1886. (2) Ltr, Adams to Craighill, 9 May 1891. Rec Gp 77, entry 995, box 1.

[21]Ltr, Craighill to Rep. James H. Platt, Jr., 28 Jan 1874. Rec Gp 77, entry 968, vol. VIII.

[22]Ltr, Craighill to editor, Baltomore *Sun*, 1 Sep 1880. Rec Gp 77, entry 984, vol. I.

[23]Editorial, Baltimore *Sun*, 2 Sep 1880. Rec Gp 77, entry 984, vol. I.

[24]Ltr, Craighill to editor, Baltimore *Sun*, 2 Dec 1880. Rec Gp 77, entry 977, vol. V.

[25]Ltr, Craighill to Fetter S. Hoblitzell of Baltimore, 14 Nov 1881. Rec Gp 77, entry 977, vol. I.

[26]Ltr, Craighill to Wright, 29 Dec 1883. Rec Gp 77, entry 977, vol. IV.

[27]Ltr, Craighill to Rep Joseph Wheeler, 2 Feb 1888. Rec Gp 77, entry 984, vol. VIII.

[28](1) Ltrs, Craighill to Sen J. W. Johnston, 24 Feb, 8 Jul and 3 Oct 1881. (2) Ltr, Craighill to John S. Tucker, Sec, Yorktown Commission, 2 Sep 1881. (3) Ltr, Craighill to J. R. Bodwell, Pres, Hallowell Granite Co., 16 Feb 1883. (4) Ltr, Craighill to Brig Gen John Newton, C of Engrs, 29 Aug 1884. Rec Gp 77, entry 984, vols. II-IV.

[29]Rpt, Bd of Engrs on Fortifications, 12 Sep 1893. Rec Gp 77, entry 995, box 2.

[30]Ltr, Hains to Brig Gen William P. Craighill, C of Engrs, 19 Jun 1896. Rec Gp 77, entry 978, vol. I.

[31]Ltr, Wilson to Lt Charles W. Kutz, 18 Mar 1898. Rec Gp 77, entry 996.

[32]Ltr, Wilson to Hains, 3 Apr 1898. Rec Gp 77, entry 996.

[33]Ltr, Hains to Wilson, 2 Apr 1898. Rec Gp 77, entry 978, vol. II.

[34]*Ibid.*, 11 Jun 1898. Rec Gp 77, entry 978, vol. III.

[35]Ltr, Craighill to Hains, 6 Aug 1896. Rec Gp 77, entry 995, box 2.

[36]Ltr, Wilson to Hains, 3 Apr 1898. Rec Gp 77, entry 996.

[37]Ltr, Hains to Wilson, 28 Apr 1898. Rec Gp 77, entry 989.

[38]Ltr, Capt Joseph E. Kuhn for Wilson to Hains, 13 May 1898. Rec Gp 77, entry 996.

[39]Ltr, Kutz to Wilson, 12 Sep 1898. Rec Gp 77, entry 989.

[40](1) Rpt, Arty Dist of Baltimore, 29 Jun 1904. Rec Gp 77, entry 995, box 6. (2) Rpt on completed seacoast fortifications submitted by Col J. C. Sanford, Baltimore Dist Engr, 10 Apr 1920. Recs of Baltimore Engr Dist; Fortifications, box 2.

[41](1) Rpt on damp-proofing at Ft Howard, 7 Aug 1902. (2) Ltr, Lt Col Charles J. Allen to Brig Gen George L. Gillespie, C of Engrs, 15 Apr 1903. Rec Gp 77, entry 995, box 5.

[42]Ltr, Albert Mott, Chief Clerk and Actg Asst Engr, to Col W. A. Jones, Baltimore Dist Engr, 10 Sep 1903. Rec Gp 77, entry 995, box 5.

[43](1) Ltr, C. Raymond Weaver, Jr Engr, to Hains, 19 Aug 1902. (2) Ltr, Allen to Gillespie, 15 Apr 1903. Rec Gp 77, entry 995, box 5.

[44]Ltr, Mott to Lt Col Richard L. Hoxie, Baltimore Dist Engr, 3 Jun 1905. Rec Gp 77, entry 995, box 7.

Chapter VII

Twentieth Century Fortifications and Military Construction

During the decade after 1905 there was a hiatus in constructing seacoast fortifications. It took World War I to bring the United States out of its lethargy. As Europe crumbled during the summer of 1914, U.S. leaders hoped their country could remain aloof; but as the war ground down to a devastating battle of attrition, it became obvious that United States' power could be decisive in determining the outcome. Most of all, the United States had world-wide commercial concerns which the war disrupted. Besides, most Americans cared who won. Therefore, real neutrality was impossible. Wars venturing onto the Atlantic area affected U.S. trade, and German submarine warfare seemed to threaten this commerce most severely. On 6 April 1917 the United States declared war on Germany.

II

By 1915, many of the defensive structures around Baltimore that the Engineers had toiled on for years were no longer effective for protecting the city. The advent of air warfare threatened to render all these batteries obsolete. The status of Fort McHenry remained indefinite. Most of its buildings had fallen into decay and were practically useless. Pressure to turn the fort into a national monument was mounting. During World War I the reservation served as a hospital. In 1925 the government dedicated the historic old fort as a national military park; in 1939 it became a national monument.[1]

Forts Howard and Smallwood remained active during World War I with the artillery manning several rapid-fire batteries at each place. The army transferred two 12-inch guns and two 5-inch guns from Fort Carroll for use on mobile mounts. At Fort Armistead three 8-inch and one 12-inch gun also were dismounted for use on mobile mounts.[2]

During the summer of 1918, the War Department authorized the Baltimore District of the Corps of Engineers to install two 3-inch anti-aircraft guns on pedestal mounts to protect the Sparrows Point shipyards. These guns had a muzzle velocity of 2,600 feet per second and fired a shell of fifteen pounds. The guns would be emplaced only for the duration of the war.[3]

In September the Baltimore District was directed to mount two more 3-inch anti-aircraft guns near the mouth of the Susquehanna River to protect the railroad bridges connecting Havre de Grace and Perryville as well as the nearby munition works.[4]. None of these anti-aircraft guns was ever installed. On 11 November 1918, German representatives signed the Armistice and five days later the Chief of Engineers, Maj. Gen William M. Black, ordered the Baltimore District to "stop all anti-aircraft work on private property and all preparatory work in connection with emergency projects."[5]

In the aftermath of the war the army

dropped plans for an elaborate searchlight defense for Baltimore and decided to abandon Forts Carroll and Armistead. All guns had already been removed from the two forts and there was no need to remount them. The Chief of Coast Artillery observed in July 1920 that the eight 12-inch mortars and two 6-inch guns at Fort Howard as well as the two 6-inch and two 3-inch guns at Fort Smallwood were "adequate for the fixed defenses in the Coast Defenses of Baltimore. Should the emergency arise, this armament could be supplemented by railway and tractor drawn artillery, which is available for the purpose."[6] The Baltimore District Engineer agreed. "Neither the island reservation at Fort Carroll," noted Col. James P Jervey, "nor the reservation at Fort Armistead, Md. nor any building on either of these reservations would be of any use to the District Engineer in connection with river and harbor improvements or otherwise." Colonel Jervey noted that the Baltimore District had taken possession of several buildings and a wharf at Fort McHenry and he believed these would be "sufficient to cover the requirements of the district for many years to come." The army officially abandoned the forts in March 1921. The Secretary of War had earlier dropped the submarine mine project for Baltimore harbor which had provided for several minefields in the main ship channel between Forts Carroll and Armistead.[8]

III

While fortifications projects were at a standstill during the 1920's and 1930's, the Baltimore District concentrated on navigation and flood control. Meanwhile, the Quartermaster Corps continued in charge of military construction other than fortifications.

All this changed during the emergency before U.S. entry into World War II. When Nazi Germany's invasion of Poland in September 1939 plunged Europe into war, the United States was ostensibly neutral. Gradually, however, the facade of neutrality was removed. On 29 December 1940, President Franklin D. Roosevelt declared that the United States would aid the Allies by becoming the "arsenal of democracy." Finally, in March 1941, Congress passed the Lend-Lease Act which empowered the President to sell, lease, transfer or lend material to any nation whose defense he deemed vital to the security of the United States. By the summer of 1941, U.S. Navy escort ships openly clashed with German U-boats in the Atlantic. An undeclared naval war raged on the high seas. In October, Roosevelt openly committed the United States to the destruction of Nazi power. But it took the Japanese attack on Pearl Harbor on 7 December 1941, to totally shatter all opposition to America's involvement in the war in Europe.

Throughout 1941, the pace of military construction had quickened in the United States. Unfortunately, the Construction Division of the Quartermaster General's Office grew unequal to the massive task that confronted it. At the same time, as its civil projects wound down, the Corps of Engineers sought new assignments. In March 1941, the Corps of Engineers was placed in charge of constructing all Air Corps projects. Finally, on 1 December 1941, President Roosevelt signed into law a bill transferring all military construction to the Corps of Engineers. No longer would two agencies of the army compete in military construction.[9]

The absorption of military construction of the Army by the Corps of Engineers drastically expanded its responsibilities. This was particularly true for the Baltimore District. One of its first World War II projects was construction of the Middletown Air Depot, 9 miles southeast of Harrisburg, Pennsylvania. By 1943, Middletown had become the Air Service Command's largest depot with storage space for equipment and 250,000 different aviation parts.

Throughout the first quarter of 1942, the Baltimore District managed thirteen separate military construction projects in Maryland, Virginia and Pennsylvania. In April 1942, the Chief of Engineers expanded the District's boundaries to include all of Pennsylvania, and this brought it an additional ten projects. To administer the work the District employed procedures it had practiced for years in civil operations. It drew up specifications and plans, awarded construction contracts and inspected structural progress. For larger projects the District established regional offices.

Diversification characterized the construction program during the war. At airports the District built runways, hangars and fueling

and lighting systems. Camps and bases needed a variety of facilities incuding barracks, lavatories, laundries, mess halls, classrooms and shops. The District also managed the building of warehouses, hospitals, ammunition plants and ordnance depots.[10]

Some of the particular building projects included bombproofing shelters for tests at Aberdeen Proving Ground, Maryland; a training station at Baltimore Municipal Airport; Curtis Bay Ordnance Depot near Baltimore; a research center for biological warfare at Camp Detrick, Maryland; Edgewood Arsenal, Maryland; Holabird Ordnance Depot and Motor Base in Baltimore; additions to Fort Meade, Maryland including a reception center; Carlisle Barracks, Pennsylvania consisting of barracks, officers' quarters, chapel, officers' candidate school, and Medical Field Service School; barracks and a chapel at Indiantown Gap, Pennsylvania; New Cumberland Quartermaster Depot and Clothing Renovation Plant near Harrisburg, Pennsylvania; New River Ordnance Depot, Virginia; Harrisburg Airfield Facilities, Pennsylvania; barracks for Military Police Companies at Pikesville, Maryland; a pier causeway at Hawkins Point, Maryland.[11]

The peak of military construction during World War II came in July 1942 and declined thereafter. By the time the United States entered its third year of the war, home-front preparations were virtually complete.[12] The Corps of Engineers had performed its task well. From 1 July 1940 to 31 December 1943, the Baltimore District spent close to $300 million for military construction.[13]

IV

Since World War II the Corps of Engineers has retained its responsibility for military construction. When combined with civil works, this gives the Corps a massive workload. In the Baltimore District, jurisdiction over military construction has expanded significantly since 1945. For example, during 1969–1970, the District absorbed military construction from the Norfolk District which covered the entire state of Virginia. During that same period the District gained all the military projects of the Louisville District except for those in Indiana. Consolidation of military construction operations of the Louisville, Norfolk and Baltimore Districts was completed on 20 June 1970.

In the decade of the 1970's the Baltimore District is in charge of military construction in Virginia, Ohio, Kentucky, West Virginia, Pennsylvania, Maryland, Delaware and the District of Columbia. Most of the District's workload generated by this military responsibility amounts to approximately seventy percent of its time and about two-thirds of its annual budget.[14] This contrasts sharply with most of the entire period since 1865 when military functions were restricted to fortifications and were only a minor part of the District's activities. In periods such as the 1920's and 1930's there was almost no fortifications construction.

Baltimore District's military construction projects since World War II have comprised a wide variety of works including building barracks, airfields, ammunition plants, hospitals and weapons laboratories. Military construction was expanded extensively during the 1960's with the growing U.S. commitment in the Vietnam war and it has continued at an intense pace into the 1970's. The scope of the military construction program can be illustrated by the dollar value of construction for fiscal years 1968 and 1969. For fiscal year 1968 the District authorized final design on twenty-one projects valued at more than $18 million. The preliminary-design program for fiscal year 1969 on seven projects had a construction value of $7,322,000. In addition, the Air Force Design Program of the District for fiscal year 1969 encompassed another seven projects worth more than $7.6 million. Between 1 January 1971 and 30 April 1971, the Baltimore Engineer District advertised and awarded contracts for eighty-two military construction projects totaling nearly $80 million.[15]

V

One of the largest Air Force projects managed by the District centered on work at Dover Air Force Base in Delaware. During the 1960's, the District supervised the construction there of weapons calibration shelter, blast pad, fuel hydrant, organizational maintenance shop, aircraft corrosion control hangar, large maintenance dock, chapel annex and air freight terminal.[16] By

the spring of 1969, the District's growing construction program at Dover amounted to about $5 million for a C-5A (Galaxy) hangar and dock, and a fire station. More than $12 million in additional work was under design.[17] Operations at Dover expanded to the point that, in October 1969, the Baltimore District Engineer, Col. W. J. Love, had to shift the resident engineer office from Edgewood Arsenal in Maryland directly to Dover Air Force Base. This residency retained control over the diminishing work at Edgewood Arsenal and at Aberdeen Proving Ground.[18]

The Baltimore District's other major Air Force enterprises concerned construction and maintenance at Andrews Air Force Base just outside Washington, and Olmsted Air Force Base at Middletown. Tasks at Andrews emcompassed projects such as design and construction of a vehicle-fueling station and a composite medical facility, additions to several buildings, and rehabilitating the 95th Fighter Squadron area. The many improvements at Olmsted included building an air-freight terminal, instrument repair shop, navigational aid facilities, approach-lighting extension and a military and industrial dispensary—all completed during fiscal year 1964. The District later added a missile maintenance shop, a communications and electronics shop and an airmen's dormitory.[19]

With the absorption of part of the military functions of the Louisville Engineer District in 1970, Wright-Patterson Air Force Base at Dayton, Ohio came under the jurisdiction of the Baltimore District. Immediately the District was burdened with the task of finishing a $15 million science avionics laboratory. After contractors completed the laboratory in April 1971, Colonel Love termed its opening "one of the District's outstanding accomplishments this year . . . . The structure is certainly in a class by itself and reflects most favorably on the Corps' construction management ability."[20]

VI

As the major construction agency for the Army since World War II, the Corps of Engineers has built many barracks and support facilities for bases around the country. For the Baltimore District these tasks have been many because of the District's sizable geographic jurisdiction.[21] One of the largest army bases the District has been responsible for is Fort George G. Meade, between Baltimore and Washington. Additions to the post were constant during the 1950's and 1960's. The Corps managed contracts for 1,000 housing units which army families began occupying in 1959. More houses built in 1961 and 1962 gave the Anne

CSA Hanger, Dover Air Force Base, Delaware.

Science Avionics Laboratory, Wright-Patterson Air Force Base, Ohio.

Operations Building, National Security Agency, Fort George G. Meade, Maryland, May 3, 1957.

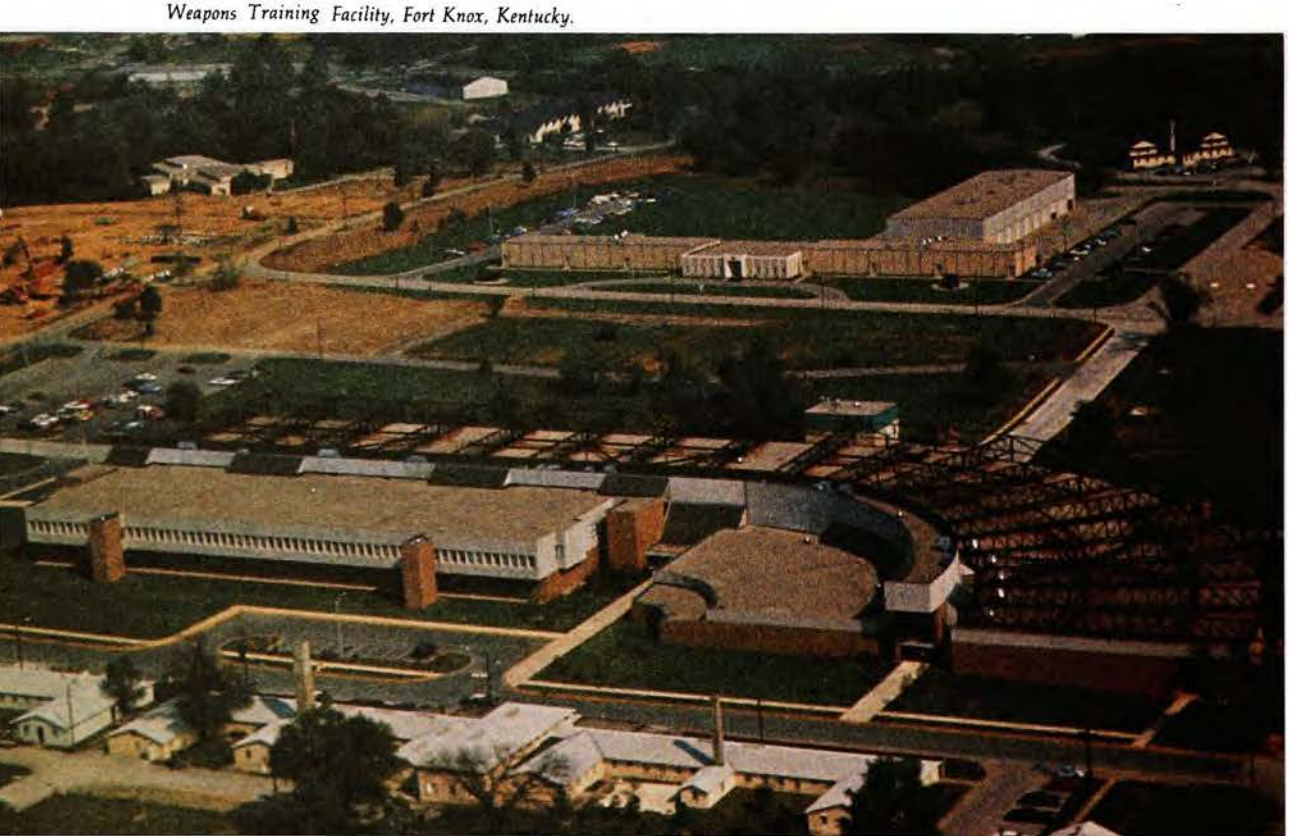
Army War College Auditorium, Carlisle Barracks, Pennsylvania.

Joint Command Headquarters, Aberdeen Proving Ground, Maryland.

Weapons Training Facility, Fort Knox, Kentucky.

Arundel County post 1,400 modern home facilities for service families. These were made of wood frame with brick veneer exteriors, asphalt-tile floors, gas heat, attic exhaust fans and concrete terraces.[22] Other contracts the Corps managed at Fort Meade during the 1960's were for constructing motor maintenance buildings, a dental clinic and an emergency power system. Also, the Baltimore District administered the building of the National Security Agency plant at Fort Meade. For example, the NSA operations building annex alone cost $10,940,240. The Government dedicated the nine-story structure in 1966.[23] Fort Meade continued to be an important center of Corps operations throughout the rest of the decade, with work beginning on a First Army Headquarters building, several housing projects, and a large barrack for the National Security Agency.[24]
barrack for the National Security Agency.[24]

Fort Ritchie, at Cascade, Maryland, also received additions, particularly during the 1960's, but not on a scale as large as those at Fort Meade. The District managed contracts at the post for a noncommissioned officers' open mess, an enlisted men's barracks, family housing, bachelor officers' quarters and enlisted women's barracks.[25] The Baltimore District supervised similar military construction at Carlisle Barracks in Pennsyl-

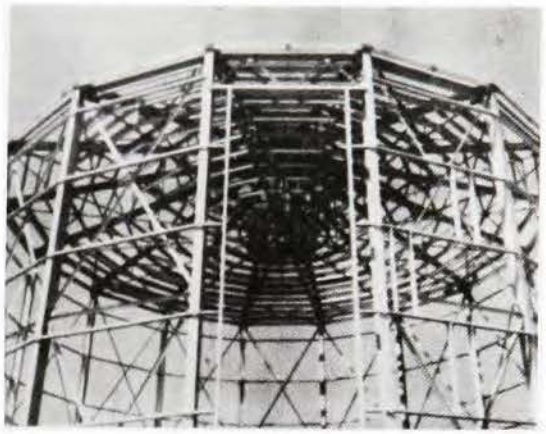


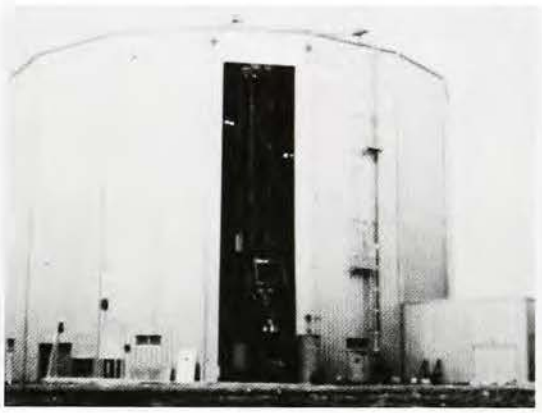
vania, Fort Myer in Virginia and, since 1970, at Forts Eustis and Lee in Virginia and at Fort Knox in Kentucky.[26]

VII

Other tasks of the Corps military construction since December 1941 are designing and building ammunition depots and weapons laboratories. In Maryland, the Baltimore District contracted for several laboratories and testing facilities at Aberdeen Proving Ground and Edgewood Arsenal. Through the mid-1960's these were busy construction sites, Aberdeen gaining a weapons system laboratory, a pulse reactor and a radiation application laboratory. At Edgewood the Corps built a clinical research facility, an environmental hygiene agency building, a super-toxic laboratory and an animal breeding center.[27] In all these endeavors the District proved equally adept in managing intricate technical and scientific construction as it had in the simpler base housing units and support facilities.

Completing the elaborate pulse reactor at Aberdeen was an especially noteworthy feat because of its complexity. The purpose of the system was to test radiation effects from nuclear weapons on army material, vehicles and fire-control systems. The entire system





Pulse Reactor Test Facility, Aberdeen Proving Ground.

comprised the reactor and control buildings joined in the center by a 1,500-yard-radius warning area and a 450-yard exclusion zone and a laboratory building standing just outside this 1,500-yard perimeter. The Engineers designed the reactor so that it could be moved from a storage pit to an experimental site over tracks by means of a remote-control reactor-handling mechanism which clamped to the reactor and lifted it to any particular track. Architects designed the interior of the reactor building so that it was column-free and had a circular spoked roof.[28] Even the training buildings at the Maryland military reservation, such as those of the Officer Candidate School were elaborate. They abandoned the traditional drab look and adopted resplendent new color schemes, masonite panel siding, flourescent lighting and air conditioning. The resident engineer at Aberdeen, John Rogalla, admitted in November 1966 that the extensive construction at the proving ground, and particularly the Officer Candidate School, was all part of the rising military construction resulting from the Vietnam war. "This is called Southeast Asia construction," Rogalla noted in the Baltimore *Evening Sun* on 10 November 1966, "which has a higher priority than any other military construction. We've been on a seven-day-a-week schedule . . . There is an acute demand for OCS training facilities."[29]

The primary technical military construction begun in the late 1960's was rehabilitating the Scranton Army Ammunition Plant in northeastern Pennsylvania; the Harry Diamond Weapons Laboratories in Hillendale, Maryland just outside Washington, D.C. and the Hercules plant at the Radford Army Ammunition Plant in Virginia. At Scranton, alterations were begun in 1968 to provide more space for dining and offices, to improve ventilation and smoke abatement, to rehabilitate the drainage and water systems, and to build foundations for four 800-ton presses and two 400-ton presses. By July 1969 the District Engineer, Col. W. J. Love, reported that the improvement work at Scranton was "progressing at an accelerated rate" with the smoke abatement project almost completed. The other sub-projects were moving along on schedule. Although work was abruptly halted by a labor strike in October, by July 1970 the design had been drawn and construction contracts let for the water reclaimer system and the presses.[30]

Building the new Harry Diamond Laboratories plant was one of the largest operations ever managed by the Baltimore Engineer District. Planning began in 1967 on the $40

Harry Diamond Laboratories

Kingman Building, Main Entrance

Construction of Walter Reed Army Medical Center

million weapons facility. In August 1968, the National Capital Planning Commission approved architectural drawings for the laboratories. Construction, in three phases, began in1971 on the general-purpose laboratory, the laboratory-reactor, the central heating and chilled water plant, the electrical sub-station and the two pump houses. Completion was scheduled for the summer of 1976.[31]

The Baltimore District during 1970 and 1971 awarded large design and construction contracts for constant-operating nitric and sulfuric acid plants at Radford Ammunitions Arsenal as well as an automated single-base propellant-manufacturing facility. The Baltimore District Engineer, Col. Louis Prentiss, Jr., said that building the acid plants was "the most difficult and complicated project" he was ever engaged in because of the uncommon materials required that included special plastics and stainless steel.[32]

Other important technical military construction by the Baltimore District during the late 1960's and early 1970's included building a medical biological research laboratory at Fort Detrick, Maryland, and the Kingman Building and Coastal Engineering Research Center at Fort Belvoir, Virginia.[33] The District also managed contracts for modifying six Nike missile sites in the Washington-Baltimore defense area and supervised the expansion of grave sites at Arlington National Cemetery until that task was temporarily transferred to the Norfolk Engineering District in July 1964.[34] Certainly the diversity of projects the District has successfully brought to fruition since World War II has been impressive.

VIII

Of the District's many achievements in military construction perhaps the most notable has been supervising the renovation and building of hospital wards of veterans' and military hospitals such as Valley Forge General Hospital in Pennsylvania, Kimbrough Hospital in Maryland and Walter Reed Army Medical Center in Washington, D.C. The most important of these endeavors has been the construction of the world's most modern hospital at Walter Reed. Groundbreaking ceremonies for the $102 million seven-story hospital were held on 26 August 1972. The Plan required that construction be done in three phases. First, existing buildings on the new construction site would be demolished and temporary structures erected elsewhere on the grounds so that the medical center could perform all its normal tasks while the new hospital was going up. The second phase—erection of the new main hospital building—began after August 1972. When it was opened for service some time after July 1976 there remained a final phase that provided for converting the original Walter Reed General Hospital into an administrative headquarters.

The new hospital, designed to accommodate the most advanced medical technology, includes training and research rooms, closed-circuit television, conference areas and an expanded medical library. Between each floor is a walkway of 6 feet 9 inches that houses all the electrical and plumbing equipment for the building. There is underground parking for more than 1,000 cars.

Besides the hospital, the District has been managing contracts for barracks at the medical center and support structures at Forest Glen, Maryland, including a complete motor pool and a laundry. The army dedicated the motor pool on 17 July 1974.

Taken as a whole, the creative construction at Walter Reed is the most massive military project the District has ever been engaged in. Col. Louis Prentiss, Jr., reflecting on his tenure as Baltimore District Engineer from July 1971 through June 1973, observed that "Walter Reed has got to be the single most important project that we did."[35]

Footnotes to Chapter VII

[1]Thompson and Newcomb, "Historic Structure Rpt, Ft McHenry," p. 80.

[2]Rpt, Maj Gen Frank W. Coe, Chief of CA, July 1920. Recs, Baltimore Engr Dist; Fortifications, box 3.

[3]Lt, Maj Gen William M. Black, C of Engrs to John S. Doyle, Actg Engr, Baltimore Dist, 13 Jun 1918. Recs of Baltimore District; Fortifications, box 3.

[4]Ltr from Brig Gen E. Eveleth Winslow, C of Engrs, to G. W. T. Miller, Actg Engr, Baltimore Dist, 6 Sep 1918. Recs of Baltimore Engr Dist; Fortifications, box 3.

[5]Telg, Black to Miller, 16 Nov 1918. Recs of Baltimore Engr Dist; Fortifications, box 3.

[6]Rpt, Coe, Jul 1920. Recs of Baltimore Engr Dist; Fortifications, box 3.

[7]Ltr, Col. James P. Jervey, Baltimore Dist Engr, to Maj Gen Lansing H. Beach, C of Engrs, 13 Aug 1920. Recs of Baltimore Engr Dist; Fortifications, box 3.

[8](1) Rpt, Coe, July 1920. (2) Ltr, C. H. Danielson, AG, to OTQMG, 23 Mar 1921. Recs of Baltimore Engr Dist; Fortifications, box 3.

[9]Lenore Fine and Jesse A. Remington, *The Corps of Engineers: Construction in the United States;* UNITED STATES ARMY IN WORLD WAR II. Washington: Office of Military History, 1972, pp. 123, 244, 267, 440, 472, 476.

[10]Technical Liaison Office, "Historical Summary of the Baltimore District Office," Jan 1944. Recs of Baltimore Engr Dist; Hist Instal File, Recs Mgt Br, Baltimore, Md. pp. 16–19.

[11](1) OCE, *Progress of War Construction Under the Supervision of the Corps of Engineers,* 30 Sep 1942, pp. 144, 145, 250, 251, 273, 274. (2) OCE, *Owned, Sponsored and Leased Facilities; Quarterly Inventory,* 31 Dec 1945.

[12]Fine and Remington, *The Corps of Engineers . . .*, pp. 519, 593, 603.

[13]TLO, "Hist Summary of Baltimore Dist Off," p. 18.

[14](1) Press release, Baltimore Engr Dist, 1969. (2) Baltimore Engr Dist, Activities of Baltimore Dist, 1 Jul 1969–30 Jun 1970. Recs of Baltimore Engr Dist; Hist Instal File. (3) Interv, Harold Kanarek with Gary Lowe, Exec Asst to Baltimore Dist Engr, 14 Dec 1973.

[15](1) Quarterly ltr, Col Frank W. Rhea, Baltimore Dist Engr, to N Atlantic Div Engr, 30 Jan 1968. (2) Quarterly ltr, Col W. J. Love, Baltimore Dist Engr, to Maj Gen C. M. Duke, N Atlantic Div Engr, 30 Apr 1971. Recs of Baltimore Dist; Hist Instal File.

[16]Baltimore Engr Dist, Activities in Delaware, 1 Jul 1963 to 30 Jun 1964. Recs of Baltimore Engr Dist, Hist Instal File.

[17]Quarterly ltr, Love to Duke, 29 Apr 1969. Recs of Baltimore Engr Dist; Hist Instal File.

[18]*Ibid.*, 29 Oct 1969.

[19]Baltimore Engr Dist, Activities in Maryland, 1 Jul 1963 to 30 Jun 1964, p. 10; Activities in Pennsylvania, 1 Jul 1963 to 30 Jun 1964, p. 6. Recs of Baltimore Engr Dist; Historical Instal File.

[20]Quarterly ltr, Love to Duke, 30 Apr 1971. Recs of Baltimore Engr Dist; Hist Instal File.

[21](1) Requests for new facilities at Army posts and at Air Force bases are justified by the using service, and along with cost estimates which the Corps of Engineers calculates, are presented to Congress. Unlike civil projects, Congress usually authorizes and funds military construction during the same session. (2) Baltimore Engr Dist, Activities in District of Columbia, 1 Jul 1963 to 30 Jun 1964. Recs of Baltimore Engr Dist; Hist Instal File.

[22]"Capehart housing" was built with private capital that was insured by the Federal Housing Authority. When construction was completed, the Secretary of the Army took over the mortgages which were paid off from rents from occupants. The post commander at each military installation administered completed housing developments. News release, Baltimore Engr Dist, 21 Nov 1962. Recs of Baltimore Engr Dist; PAO, box 2.

[23]*Ibid.*, 26 Jun 1966. Baltimore Engr Dist, Activities in Md, 1 Jul 1963 to 30 Jun 1964, p. 9. Recs of Baltimore Engr Dist; Hist Instal File.

[24]Quarterly ltr, Love to Duke, 29 Apr 1969. Recs of Baltimore Engr Dist; Hist Instal File.

[25]Baltimore Engr Dist, Activities in Md, 1 Jul 1963 to 30 Jun 1964, p. 9. Recs of Baltimore Engr Dist; Hist Instal File.

[26](1) *Ibid.*, Activities in Pennsylvania and Virginia. (2) Quarterly ltr, Love to Duke, 30 Apr 1971. Recs of Baltimore Engr Dist; Hist Instal File. (2) Col Louis W. Prentiss, Jr., who served in Baltimore District Engineer from 1 July 1971 to 30 June 1973, characterized a new classroom building at Fort Knox as "the prettiest architectural work that I think we've done." Interv with Kanarek, 9 Aug 1974.

[27]Baltimore Engr Dist, Activities in Md, 1 Jul 1963 to 30 Jun 1964, p. 8. Recs of Baltimore Engr Dist; Hist Instal File.

[28]Baltimore Engr Dist, "Pulse Reactor Test Facilities" (PAO, n.d.). box 1.

[29]Baltimore *Evening Sun*, 10 Nov 1966. PAO, box 1.

[30]Quarterly ltrs, Love to Duke, 31 Jul and 29 Oct 1969 and 30 Jul 1970. Recs of Baltimore Engr Dist; Hist Instal File.

[31]Interv, Kanarek with Maj Joseph M. Stehling, Resident Engr, 19 Aug 1974.

[32]Interv, Kanarek with Prentiss, 9 Aug 1974.

[33](1) *Ibid.* (2) Quarterly ltr, Love to Duke, 29 Oct 1969. Recs of Baltimore Engr Dist; Hist Instal File.

[34]Baltimore Engr Dist, Activities in Md and Va, 1 Jul 1963 to 30 Jun 1964. Recs of Baltimore Engr Dist; Hist Instal File.

[35]Interv, Kanarek with Prentiss, 9 Aug 1974. Military construction projects managed by the Baltimore District since World War II have been so many as to preclude mentioning all. This is especially true for the period of the Vietnam war and the expansion of the Baltimore District's military construction jurisdiction during 1969–70.

Chapter VIII

A Mixed Picture: Navigation Operations in the Early Twentieth Century

The most important of all civil functions of the Corps of Engineers during the first three and a half decades of the twentieth century were improvements in river-and-harbor navigation.[1] This work included preliminary examination, survey and cost estimating for new operations and maintaining and repairing previously deepened waterways. The Corps employed various procedures besides dredging to facilitate ship travel such as constructing jetties, breakwaters and locks. Often a combination of several methods proved successful, not the least of which was the simple removal of debris and snags that blocked streams.

River and harbor improvements persisted in popularity after the Spanish-American War. In the Baltimore District, responsibility for waterways centered primarily on those in Maryland. The many Eastern Shore projects started in the nineteenth century were constantly maintained and the District began new enterprises at such places as Tilghman Island harbor, Slaughter Creek, Twitch Cove and Big Thoroughfare River. But despite the proliferation of projects on the Eastern Shore, expanding the approach channels to Baltimore harbor remained the District's most important venture in the state. In addition, the Baltimore office started operations at Annapolis, Ocean City and in a couple of channels in Virginia.

The District maintained a lively pace in navigation improvements until World War I, when Congress understandably slashed appropriations for civil works in order to devote full attention to the war effort. Actually, the District had a brief respite during 1903 when the Chief's office shifted the Maryland Eastern Shore projects to the Philadelphia office for that year. By 30 November 1903, however, the Baltimore District Engineer, Lt. Col. Richard L. Hoxie, was back in charge of Chesapeake Bay operations.[2]

During the 1920's, the dredges that had treaded up and down the Eastern Shore's streams since the 1880's were seen infrequently. They returned with the resumption of operations at many project sites in the 1930's when the Corps received funds from New Deal relief agencies such as the Works Progress Administration and the Public Works Administration for navigation and flood-control ventures. For example, in 1933 the PWA allotted $281,000 for the Corps to construct an inlet between the Atlantic Ocean and Sinepuxent Bay at Ocean City, Maryland.[3]

II

In the years before World War I, the District's operations on Maryland's Eastern Shore changed little from the days of the late nineteenth century. Dredging companies contracted by the District maintained and finished project depths on rivers, creeks, streams and harbors of all sizes. These

encompassed Broad, Corsica and Tyaskin Creeks; the harbors at Cambridge, Claiborne, Crisfield, Queenstown and Rock Hall; and in Chester, Choptank, Elk, LeTrappe, Manokin, Nanticoke, Pocomoke, Warwick and Wicomico Rivers. Work at most of these places comprised routine contract dredging. However, at several of these sites situations arose which sometimes embroiled the District in controversy.

On the Elk River and the Little Elk River, on the northern shore around the town of Elkton in Cecil County, an 1890 project that provided for a channel eight feet deep and 100 feet wide at the mouth of the Little Elk River, running about a mile to Elkton, was still incomplete. The District Engineer, Col. Peter C. Hains, noted in 1902 that the channel had shoaled considerably. The dredging which resumed at the end of that year sought to reach the eight-foot depth required.

The Elk River project was the pet of Representative William. H. Jackson of Salisbury who not only wanted the dredging completed in order to improve Elkton's commerce, but in April 1903 requested special excavations on the channel for a particular citizen. He wrote the Chief of Engineers, Brig. Gen. George L. Gillespie, that "it is very important . . . that the channel in front of the yards of the Messrs. Diebert should be dredged. These yards, in which a large number of men are employed, are situated on the Little Elk Creek at just about its junction with the Big Elk River." Since only two or three days of dredging were required, Jackson concluded "I trust you will see that this work is done." General Gillespie did not accede to the request, saying that such dredging was impracticable because of insufficient funds.[4]

Attaining and maintaining the project depth in the channel to Elkton proved difficult because of constant reshoaling. In May 1904, a group of the town's businessmen complained that work on the Elk River was being done unsystematically and carelessly and that spoil had been dumped only fifty feet from the water where it could easily slide back into the stream. The inspector on the scene denied the accusations, blaming the shoaling on "natural causes." "I find no indications of any of the material deposited over the banks along the river having been washed back into the channel," he observed, "in any portion of the work." Rather, the trouble was caused by several heavy freshets which during the past year had carried large quantities of ice and brush downstream. To inspector Charles M. Bird maintaining a navigable depth in the Elk River would require yearly dredging.[5]

Two years later, however, District Engineer Hoxie acknowledged that the dumping of spoil had caused at least part of the reshoaling and he ordered that in the future the excavated mud be hauled far below the present operations site. "Material dredged heretofore has been deposited upon the banks of the stream," Hoxie informed the Chief of Engineers, "and has no doubt to a considerable extent, been returned by the washing and caving of the banks."[6] During 1907-1908 contractors removed 91,484 cubic yards of mud from the Elk River. By the end of 1908 Hoxie could report that the project depth had been Reached.[7]

On 25 July 1912, dredging began on a new project at the junction of the Elk and Little Elk Rivers. The excavation which Congress approved in the River and Harbor Act of 1912 authorized a channel from the junction of the two rivers, seven feet deep and eighty feet wide, 1,200 feet up the Elk River and 2,000 feet up Little Elk River. Local interests contributed one-third of the $6,000 spent on the dredging. As a result of all the work done in these two rivers, in 1916 a steamboat company established daily service between Baltimore and Elkton. But after World War I the Chief of Engineers recommended no other work for the area, characterizing commerce on the Elk River as negligible.[8]

Nothing was done on these two rivers until the River and Harbor Act of 1930 modified the project by narrowing the Elk River portion to forty feet. The Act required local interests to contribute fifty percent of the cost of new work and subsequent maintenance. In 1931 and 1932, under an allotment of $6,000 of federal funds and an equal non-federal contribution, the Corps contracted for dredging in the Elk and Little Elk Rivers, but ran out of money 1,000 feet short of the goal. Repeated efforts to obtain additional funds from local groups were unsuccessful and no further work was done on the project.[9]

In 1935 the District Engineer, Col. Elliot J. Dent, recommended that no future efforts be made to improve navigation in these waterways. Not only was the volume of commerce

insufficient to justify continued operations; the considerable shoaling since 1932 proved to Dent that the project dimensions could not be maintained by dredging alone.[10] The Chief of Engineers, Maj. Gen. Julian L. Schley, speaking of the Elk and Little Elk Rivers, noted in 1939 that "little or no commerce moves over the improvements at the present time."[11]

In 1972, the value of dredging the Elk River could still be questioned. In that year the Baltimore District Engineer, Col. Louis W. Prentiss, Jr., rejected a new project on the lower Elk River for a channel sixteen feet deep and 150 feet wide from the entrance channel of the Chesapeake and Delaware Canal to an anchorage basin 200 feet wide and 600 feet long adjacent to land on the west bank of the lower Elk River. The proposed channel would serve as a highway to transport sand and gravel from Cecil County to other places in Maryland, principally the Baltimore metropolitan area. "We have found that such an improvement would be used by only one company,"Prentiss informed the Cecil County commissioners, "with little prospect for use by other companies. The Federal Government does not participate in navigation improvements where the benefits will accrue to only one company. Therefore, I will recommend that no Federal improvements for navigation be made in the lower Elk River at this time."[12]

To the south, on the Chester River, dredging resumed without incident where it had left off in 1899 in the upper portion of the river from Crumpton to Jones Landing. By 1913, a channel six feet deep and sixty feet wide had been completed. In 1924, the District Engineer, Maj. Francis C. Harrington, recommended no new work because of insufficient commerce, but in April 1929, maintenance dredging began to restore the channel of the river between Kent Island and Eastern Bay. The dredges returned to this section of the river in 1934, 1943, 1955, 1960, 1964-65 and 1970-71.[13] The contractor in 1964 complained bitterly about difficulties encountered because his equipment ran into unexpected rock, stone and clay which "so severly damaged the hauling gear and cutter configuration that it was in constant disrepair .... We had to shut down and have hauling gear made and installed in order to complete the project." The contractor originally expected the job to take him about a month; but instead the task dragged on for 117 days.[14] There was some new dredging on the Chester River around Wells Cove near Kent Island narrows in 1950 at a cost of $21,000. In 1971, the Chief of Engineers concurred with the Baltimore District Engineer, the Division Engineer and the Board of Engineers and rejected further improvement of the Chester River in the vicinity of Kent Island Narrows as not economically justified.[15]

Major Francis C. Harrington was the Baltimore District Engineer from January 1, 1921 to July 7, 1924. U.S. Signal Corps.—National Archives

At Rock Hall harbor, in lower Kent County, District operations from their inception had been surrounded by controversy. Watermen continued to complain that the dumping of spoil had destroyed valuable oyster beds. Before excavation began in November 1903 of a channel sixty feet wide and twelve feet deep from Rock Hall toward

Unloading oysters at Rock Point Harbor, Maryland, April 1941. Farm Security Administration Photograph.—Library of Congress

Tonging and culling oysters on the Wicomico River, Maryland. Farm Security Administration Photograph.—Library of Congress

Chesapeake Bay for a distance of 4,775 feet, oyster interests urged the Corps to deposit the waste material far out in the bay instead of around Rock Hall in Swan Creek Inlet. The President of the Chester River Steamboat Company, speaking for the Rock Hall petitioners, importuned the army "to secure such dumping grounds which will not impair the fishery business."[16] The Corps resolved the immediate problem by deciding to dump spoil in twenty-foot water in Chesapeake Bay, after which the complaints ceased.[17] However, the value of clearing such a channel was still being debated, and in 1917 the District Engineer, Col. Walter L. Fish, recommended abandoning the project because of insufficient navigation.[18] Later, the dredges left Rock Hall and did not return until Congress approved a new project in 1937. By then a large number of boats engaged in gathering and marketing sea foods were using the harbor.

The 1937 project not only provided for enlarging the channel by dredging, but constructing twin breakwaters at the harbor entrance. Between 15 March and 12 May 1939, the District supervised the construction of the 1,500-foot jetties out of approximately 8,424 tons of stone. Contractors further deepened the harbor in August 1956 and repaired the breakwaters in 1964.[19]

Cambridge Harbor, Maryland, August 1941. Farm Security Administration Photograph.—Library of Congress.

Oystermen also protested the dredging at Claiborne harbor on the eastern shore of Eastern Bay in Talbot County. The Baltimore, Chesapeake and Atlantic Railroad, with a wharf at Claiborne, had performed some of its own dredging in 1898 and again in 1902. Watermen charged that the railroad, in the process of dumping the dredged waste, had destroyed at least ten acres of oyster beds and bars. They petitioned the army to see that in its dredging of the harbor, to begin in 1903, that it deposit spoil in water at least sixty feet deep to prevent further damage. The army agreed on a dumping area in the deep water of Eastern Bay, and that ended the protest.[20] Dredging began on 4 August 1903. With off-and-on operations over the next several years, the project to dig a channel twelve feet deep and 300 feet wide from Eastern Bay to the railroad pier in the harbor was finished in 1913. Thereafter, the only other work at Claiborne was maintenance dredging in 1929-30.[21]

The Baltimore District's first dredging projects on Maryland's Eastern Shore had been at Queenstown and Cambridge harbors, and operations continued at both ports during the twentieth century. By 1913, Queenstown harbor was ten feet deep and 200 feet wide from the Chester River to the inner wharves.[22] Besides dredging at Cambridge, which was one of the most important commercial and industrial centers on the Eastern Shore, the District also faced the task of removing wrecked ships which obstructed navigation. In May 1901, the harbor master at Cambridge reported the docks blocked by four sunken vessels which had been abandoned by their owners. Immediate removal was mandatory. In July, the assistant engineer at the site, George Miller, supervised a contractor in lifting the obstructions out of the water. The contactor chained the hulks to a large scow, towed them about two miles below Cambridge and deposited them on shore. "They are entirely out of the way of navigation," Miller reported on July 15, "and can do no damage . . . ."[23]

Whereas dredging such small streams as the Warwick, Manokin and La Trappe Rivers produced no long-range economic benefit for the Eastern Shore, excavating the Nanticoke, Choptank and Wicomico Rivers aided local sea-food boats that used their waters. This was particularly true of the Wicomico River which leads to the major Eastern Shore city of Salisbury. The Chief of Engineers, Maj. Gen. Edward M. Markham, told Congress in 1937 that as a result of Corps of Engineers work on the Wicomico, commerce had expanded at Salisbury from 67,173 tons in 1926 to 215,899 tons in 1935.[24]

Dredging on all these waterways progressed with no unusual incidents, the District always striving to avoid disputes with the oyster industry. In 1965, the District Engineer Lt. Col. Frank W. Rhea, praised the maintenance dredging contractor on the Wicomico for cooperating with state and county officials and local watermen "to avoid adverse public reaction and claims against Wicomico County for damages to oyster beds."[25]

On the Pocomoke River, on the southern shore, constructing an artificial water highway was more complicated because of constant reshoaling at the entrance to Pocomoke Sound in a section known as "the Muds." Earlier improvements had been confined to the upper portion of the river between Shad Landing and Snow Hill, but in 1935 Congress authorized digging a channel seven feet deep and 100 feet wide through "the Muds." Unfortunately, such a channel required constant maintenance, the cost of which far exceeded any prospective benefits. Nevertheless, the Corps continued to dredge the channel, which in 1966 Colonel Rhea characterized as too costly to maintain. Congress approved a relocation of this portion of the channel in 1954, but the District Engineer placed the project in the inactive class in 1971 because of a failure to obtain local cooperation.[26]

Just north of the Pocomoke River, at Crisfield harbor on the Little Annemessex River, the District excavated a 150-foot-wide harbor in 1875 and then did nothing for the next thirty-two years. By 1905, boatmen reported groundings. Finally, in 1907, the Corps of Engineers began to restore the original channel. By 1913, the harbor was larger than ever, with a depth of twelve feet and a width of 425 feet.[27] Such improvements helped Crisfield become one of the principal sea food markets on Chesapeake Bay with many oyster and crab-packing plants operating in the area.

Proposals for further expanding the harbor in 1936 became complicated because each

packing plant wanted future dredging done near its facility. "There are apparently some strong factions," the District Engineer, Col. Elliot J. Dent, observed, "each working towards his particular plan, and it is very difficult to secure candid expressions of opinion from anyone in open meeting or in conference where a number are present."[28] Some wanted Somers Cove improved to provide better access to packing plants on the east side of town. Others preferred that the channel from Crisfield to Tangier Sound to the west be deepened and widened. Still another faction fought for a small-boat harbor adjacent to Hop Point near the center of the business district. That project gained approval, but the government was unable to acquire the necessary rights of way. Finally, after World War II, between 1945 and 1948, the Corps supervised the excavation of a channel seven feet deep and 160 feet long connecting the Little Annemessex and Big Annemessex Rivers. [29]

Future work authorized in 1954 provided for an anchorage basin in Somers Cove ten feet deep and 600 feet wide with an approach channel in the Little Annemessex River. Thereafter, Somerset County formulated plans for constructing an Annemessex industrial center on a 2,000-acre tract near Crisfield, and requested the army to excavate a navigation channel thirty-five feet deep to accommodate the industries intending to locate in the area. In 1971, it appeared that the industrial center would never be constructed because of possible adverse effects on the environment. Therefore, the District Engineer, Col. Louis W. Prentiss, Jr., recommended "that no further action be taken toward providing a deeper Federal channel to Crisfield."[30]

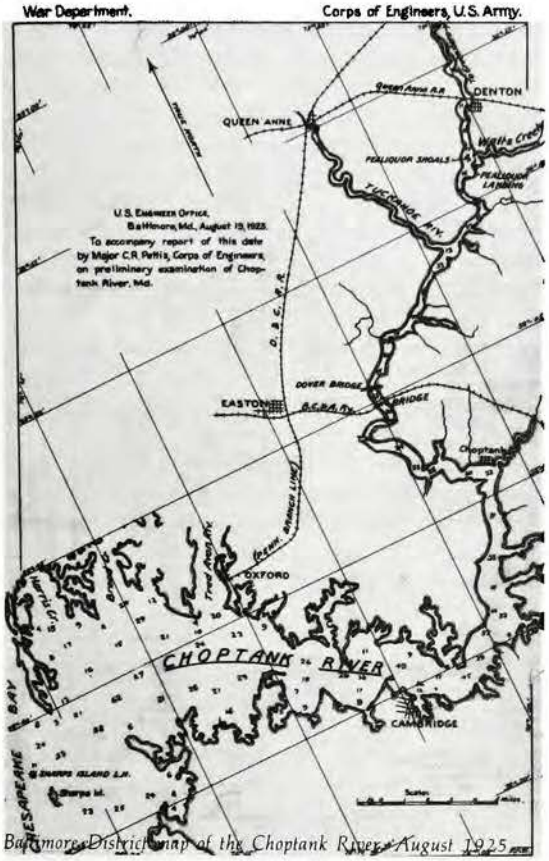
The River and Harbor Act of July 1912 approved several new projects on Maryland's Eastern Shore, again increasing the District's workload and spreading its influence to more of the smaller streams in the region. On narrow, marshy Tuckahoe River that rises in Queen Annes County and empties into the Choptank River about eight miles below Denton, the improvement required removing shoals in a one-mile section between the tiny villages of Waymans Wharf and Rolphs Landing. On another tributary of the Choptank, at Slaughter Creek off Chesapeake Bay, the District managed the dredging of a channel seven feet deep and 100 feet wide through a bar at its mouth.[31]

The Tred Avon River, rising near Easton in Talbot County, also flows into the Choptank about ten miles upstream from its mouth on Chesapeake Bay. Many lovely creeks with quiet anchorages protected from winds branch off the main stream. Completed project dredging in 1914 left a channel on the Tred Avon eight feet deep and 150 feet wide from Peachblossom Creek to Easton Point, with a turning basin at the mouth of the South Fork. The waterway has not reshoaled eliminating the need for any maintenance dredging. The River and Harbor Act of March 1919 provided for a channel extension in the North Fork, but because of a lack of local cooperation, the army did no digging in the channel.[32]

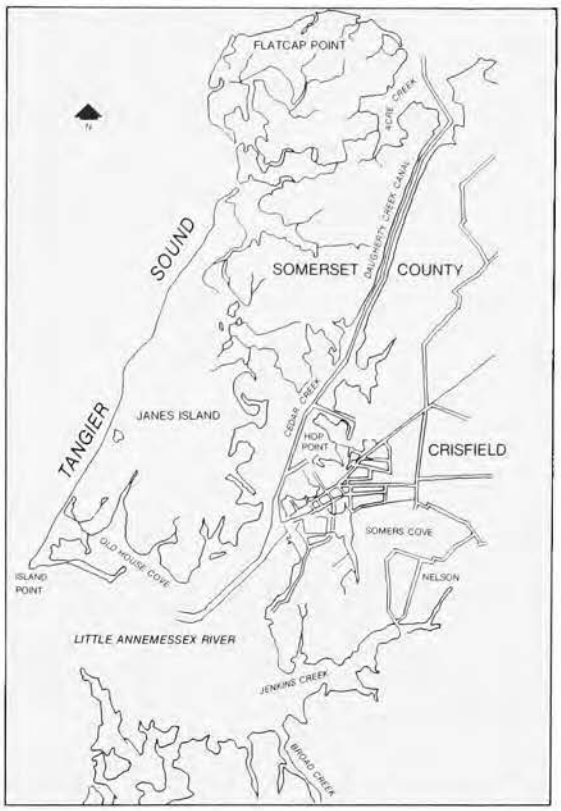
Tilghman Island lies between Chesapeake Bay and the Choptank River. In 1913, District dredged a ten foot deep anchorage basin at the small harbor on its easterly side. Insufficient commerce, however, forced terminating the harbor's improvement in June 1922. Dredges did not return to Tilghman Harbor until the late 1960's.[33]

The most enduring Eastern Shore project, started in 1912, was at Smith Island between Tangier Sound and Chesapeake Bay. Situated about 110 miles south of Baltimore, the island is divided by border between Maryland and Virginia. Almost the entire island is low marshland, and its inhabitants earn their livelihoods primarily through gathering sea food. Rhodes Point, Tylerton and Ewell are the island's main settlements. The residents of Smith Island depend entirely upon water transportation for receiving and shipping all their commodities. The original Congressional authorization for improving the island's waterway provided for a channel four feet deep and twenty five feet wide from Tangier Sound into the Big Thoroughfare River on the eastern side of the island. It also approved another channel of the same dimensions from the Big Thoroughfare River to Tylers Creek. The goal of opening up small-craft transportation on the island proved successful. As a result of dredging in 1913 and 1914, small boats which used these waterways only at high tide could now travel on them through all fluctuations in the water level.[34]

Unlike some other projects started in 1912, this one was not dropped but expanded.

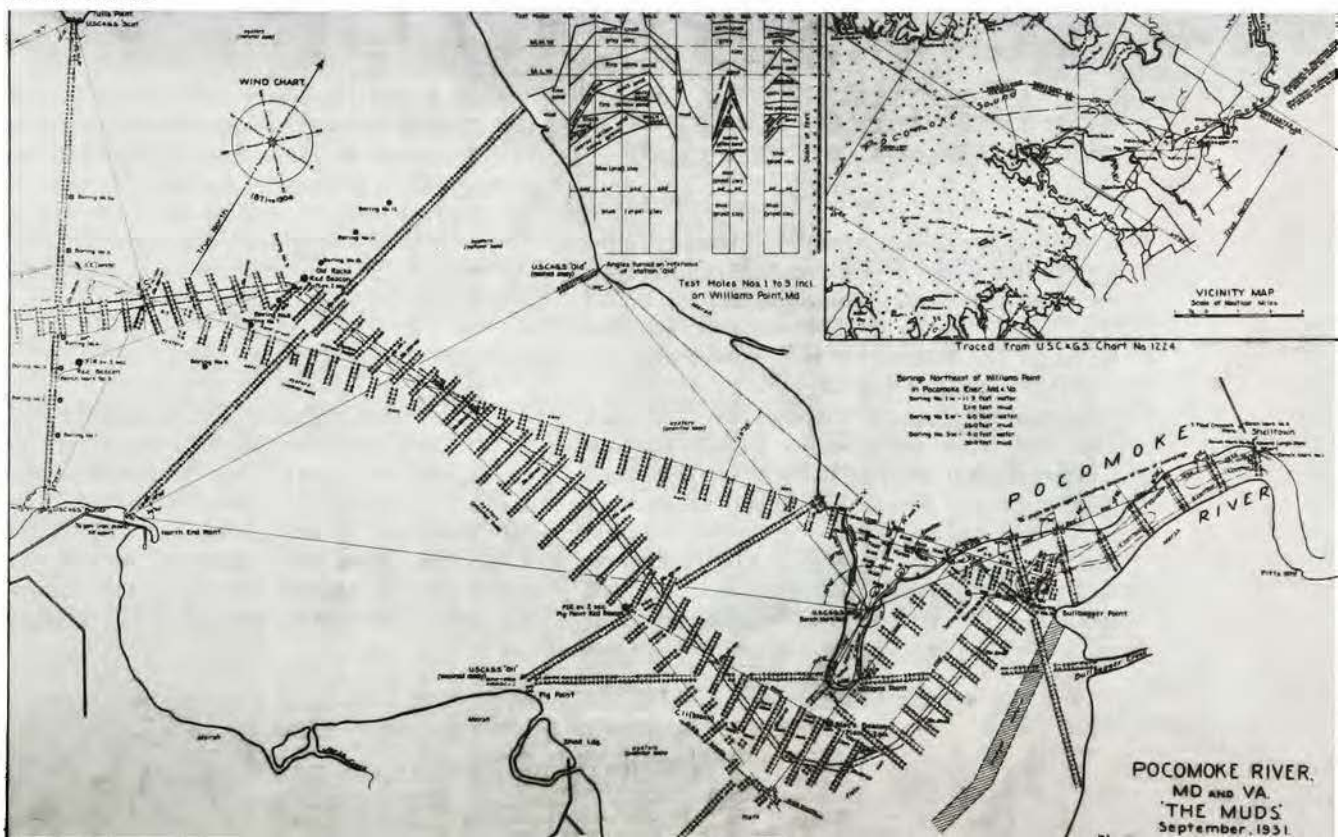


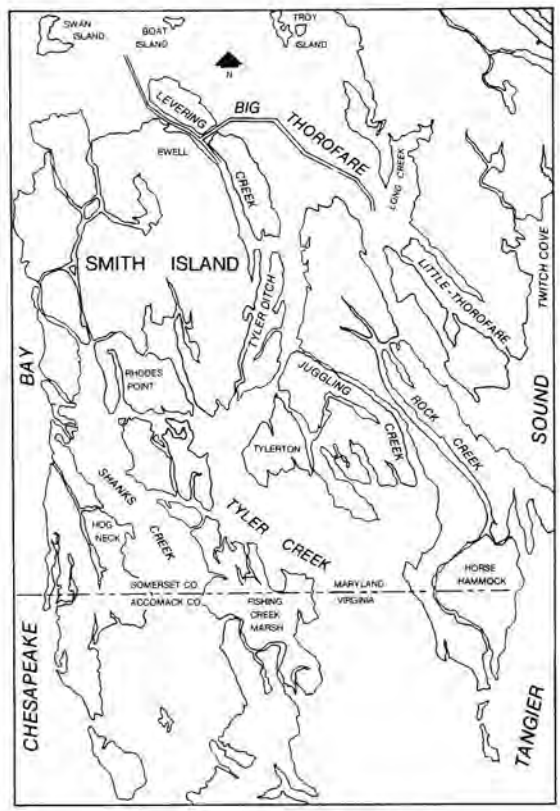
Baltimore District map of the Choptank River, August 1925.—National Archives



Crisfield Harbor, Maryland

Survey map of the entrance to Pocomoke Sound showing "The Muds," a section notorious for its constant reshoaling, September 1931.—National Archives





Twitch Cove and Big Thorofare River, Maryland.

Congress approved several new-work dredging for the island in later years. Also, periodic maintenance dredging kept the Corps busy on the small creeks and streams that flow through the island. In 1931 and 1932, the District managed the digging of a channel from Tangier Sound through Twitch Cove and Big Thoroughfare to Ewell. Further Congressional authorizations in 1935 and 1938 enlarged the depth of this channel to seven feet and provided for constructing twin stone jetties at the Chesapeake Bay entrance. Contractors completed the dredging and the jetties by the end of 1941. Finally, in 1950, Congress approved the dredging of a 700-foot-long anchorage basin at Ewell. The contractor completed the excavation in September 1956.[35] Since then, maintenance dredging and jetty repair have been frequent. Channel shoaling between the jetties caused hardships in 1970. "There have been reports of groundings of up to 12 hours," the District Engineer, Col. W. J. Love, reported in February 1970, "and in one instance a tanker that served Smith Island with fuel oil was aground for 5 hours." A survey disclosed that water depth in some places was no more than four and one half feet. The District responded quickly to the emergency and did critical dredging in 1970-71 to remove the shoals that were blocking the highway.[36]

The Baltimore District did not confine itself solely to these various dredging projects on Maryland's Eastern Shore. Under federal river-and-harbor legislation the Corps also administers regulations for preserving navigable waterways. For example, it must grant permits for private dredging and dumping as well as study applications for erecting permanent structures which might adversely inhibit the passage of water traffic.

In 1901, the Baltimore District office oversaw the construction of bridges across Kent Island Narrows and Broad Creek River. During that same year the War Department placed the District in charge of supervising the laying of cable by the Eastern Shore Telegraph and Telephone Company across Chesapeake Bay between Kent Island and Sandy Point.[37]

Also, under the River and Harbor Act of 1866, the Corps has the duty of collecting data on the volume of water-borne commerce on streams throughout the nation. Because of the many estuaries and harbors on Maryland's Eastern Shore, the collection of statistics on commerce by Baltimore Engineering District has always been extensive.

III

On the western banks of Chesapeake Bay, on the Susquehanna River near Havre de Grace, the Baltimore District started dredging in 1858. Since the failure of the movable-dam deflector in the 1860's and 1870's, the Corps has relied upon dredging to keep the authorized navigation channels open. Following the Spanish-American War dredges

A pier at Deale Island on Maryland's Eastern Shore for oyster and crab boats, May 1940. Farm Security Administration Photograph.—Library of Congress

continued digging on an 1882 project which provided for a channel in the Susquehanna 200 feet wide and fifteen feet deep, from Chesapeake Bay to Havre de Grace, and for removing a shoal opposite Watson Island, just above Havre de Grace, to a depth of eight feet. By 1915, the project dimensions had been reached. No new operations have been begun because of the sparsity of commercial traffic.[38] The river is not navigable above Port Deposit, and few vessels plied the river around that place and Havre de Grace even in the years immediately after the turn of the century when the channel was being deepened. Commerce consisting mainly of loads of lumber, cement, saltfish and granite passing on the Susquehanna River at Havre de Grace declined from 135,293 tons in 1905 to 73,815 tons in 1906 and down to 37,936 in 1908. At the same time, improving the river made no appreciable difference in freight rates. Although tonnage picked up slightly during 1910 and 1911 and again after the war, shippers took no prolonged advantage of the improved waterway. The project depth has been maintained periodically, and in 1936-37 the Works Progress Administration dredged a small boat harbor at Havre de Grace.[39]

Annapolis harbor has always been of minor commercial importance. Only the presence of the United States Naval Academy justified any dredging at all. With the Navy Department in charge of maintaining an open waterway from Annapolis along the Severn River to Chesapeake Bay, the Army Engineers confined their functions to surveys. The Severn River was used mainly by pleasure vessels. In 1931 the District Engineer, Major J. D. Arthur, Jr., succinctly stated why there was no current Corps project for improving Annapolis harbor: "The commerce from Annapolis is slight."[40]

The Baltimore District was in charge of a couple of minor navigation projects in Chesapeake Bay and the upper region of Virginia's Eastern Shore in the period before flood-control operations started in 1936. This included surveys of Tangier Harbor in Tangier Sound and Starlings Creek, an estuary of Pocomoke Sound about eleven miles southeast of Crisfield, Maryland. In Occohannock Creek, a tidal estuary of Chesapeake Bay that forms a portion of the dividing line between the counties of Accomac and Northampton, the District in 1931 oversaw the dredging of a channel nine feet deep and 100 feet wide across a bar at the mouth of the creek for a distance of about one mile.[41]

IV

A survey of navigation operations of the Baltimore District begun before 1936 presents a mixed picture. At some ports, commerce expanded while at others improvement was negligible. Although there was no broad planning to coordinate these various waterway renovations, on the whole the projects on Maryland's Eastern Shore provided this isolated region with an economic lifeline to the mainland, particularly the Baltimore harbor.

Footnotes to Chapter VIII

[1]For fiscal year 1901, seven-eighths of the Baltimore District's budget was devoted to river-and-harbor improvements. Chart of Expenditures for FY Ending 30 Jun 1901. Rec Gp 77, entry 985, vol. VIII.

[2]In 1924, Maj. Francis C. Harrington, Baltimore District Engineer, recommended that because of negligible traffic, no new work be undertaken at these sites on Maryland's Eastern Shore: Elk River, Chester River, Corsica Creek, Tilghman Island, Tred Avon River, LaTrappe River, Tuckhoe River, Choptank River, Warwick River, Slaughter Creek, Nanticoke River, Broad Creek, Tyaskin Creek, Pocomoke River, Lower Thoroughfare River and Twitch Cove. Annual Rpt, C of Engrs, 3 Oct 1924, pp. 414-435.

[3]Ltr, Col. Elliot J. Dent, Baltimore Dist Engr, to Albert C. Ritchie, Gov of Md, 15 Sep 1933. Recs of Baltimore Engr Dist, Washington Nat Rec Ctr, Suitland, Md, Rec Gp 77, ACC 71A939, box 46.

[4]Ltr, Rep William H. Jackson to Brig Gen George L. Gillespie, C of Engrs, 27 Apr 1903. Rec Gp 77, entry 994, box 4.

[5](1) Ltr signed by twenty-one citzens of Elkton, Md, to Col Richard L. Hoxie, Baltimore Dist Engr, 5 May 1904. Rec Gp 77, entry 994, box 3. (2) Ltr, Jr Engr Charles M. Bird to Sanford, 19 May 1904. Rec Gp 77, entry 994, box 4.

[6]Ltr, Hoxie to Brig Gen Alexander MacKenzie, C of Engrs, 6 Mar 1906. Nat Archives, Rec Gp 77, entry 994, box 4.

[7]Index to Rpts of C of Engrs; vol. I, Rivers and Harbors, p. 360.

[8]Annual Rpts, C of Engrs, 5 Oct 1916, p. 426; 3 Oct 1924, p. 414.

[9]Ltr, Col Roy S. Kelley, Baltimore Dist Engr, to Rep Carlton R. Sickles, 6 Aug 1964. Recs of Baltimore Engr Dist; Mailing and Recs Br, box 173.

[10]Rept, Col Elliot J. Dent to WD, 4 May 1935. Rec Gp 77, ACC 72A2510, box 87.

[11]Ltr, Maj Gen Julian L. Schley, C of Engrs, to Sec War Harry H. Woodring, 19 Dec 1939. Rec Gp 77, ACC 72A2510, box 87.

[12]Ltr, Prentiss to Commissioners of Cecil Co, Md, 8 Aug 1972. Recs of Baltimore Engr Dist; Mailing and Recs Br, box 173.

[13]Annual Rpts, C of Engrs, 11 Aug 1913, pp. 376-77; 3 Oct 1924, p. 415; 3 Aug 1929, p. 444; 22 Sep 1930, p. 470; 28 Sep 1931, p. 457; 31 Oct 1935, p. 334; 1955, p. 192; 1965, vol. II, p. 241; 1971, vol. II, pp. 4-5.

[14]Ltr, Oliver F. Gilbert, Jr., contractor, to John L. Reynolds, Ch, Ops Div, 3 Oct 1964. Rec Gp 77, ACC 68A2565, box 124, folder 1506-12.

[15](1) Annual Rpt, C of Engrs, 6 Oct 1950, p. 393. (2) Ltr, Lt Gen F. J. Clarke, C of Engrs, to Sec Army, Dec 1971. Recs of Baltimore Engr Dist; Mailing and Recs Br, box 173.

[16]Ltr, George Warfield, Pres, Chester River Steamboat Co., to Col Jared Smith, 24 Apr 1903. Rec Gp 77, entry 994, box 11.

[17]Ltrs, Inspector John Beckett to Hoxie, 1 Apr 1904 and 26 Oct 1905. Rec Gp 77, Entry 994, box 11.

[18]Annual Rpt, C of Engrs, 8 Oct 1917, p. 444.

[19](1) Ltr, Maj Gen Edward M. Markham, C of Engrs, to Woodring, 2 Apr 1937. Rec Gp 77, ACC 71A939, box 48. (2) Ltr, Lt Col D. F. Tollis to Rep Rogers C. B. Morton of Md, 2 Aug 1963. Recs of Baltimore Engr Dist; Mailing and Recs Br, Box 118. (3) Annual Rpts, C of Engrs, 9 Oct 1939, pp. 411-12; 1957, vol. II, p. 280; 1964, vol. II, p. 262.

[20]Ltr, Lt Col Charles J. Allen to Brig Gen George L. Gillespie, C of Engrs, with enclosed petition from twenty citizens of Claiborne area to Bd Pub Works of St of Md, 12 May 1903. Rec Gp 77, entry 994, box 3.

[21](1) Ltr, Beckett to Sanford, 5 Oct 1903. Nat Archives, Rec Gp 77, entry 994, box 3. (2) Annual Rpts, C of Engrs, 11 Aug 1913, p. 375; 3 Aug 1929, p. 447; 28 Sep 1931, p. 462.

[22]*Ibid.*, 11 Aug 1913, p. 373.

[23]Ltr, Asst Engr George Miller to Lt Col Oswald H. Ernst, Baltimore Dist Engr, 15 Jul 1901. Rec Gp 77, entry 1006.

[24]Ltr, Maj Gen Edward M. Markham, C of Engrs, to Sen Royal S. Copeland, Chmn, Comm on Commerce, 12 Apr 1937. Rec Gp 77, ACC 71A939, box 51.

[25]Ltr, Lt Col Frank W. Rhea, Baltimore Dist Engr, to D. D. Atkinson, Pres, Atkinson Dredging Co., 14 Sep 1965. Rec Gp 77, ACC 68A2565, Box 124, folder 1506-12.

[26](1) Ltr, Dent to S Atlantic Div Engr, 4 Mar 1937. Rec Gp 77, ACC 71A939, box 48. (2) Ltr, Rhea to Morton, 12 Oct 1966. Recs of Baltimore Engr Dist; Mailing and Recs Br, box 95. (3) Ltr, Col Leonard Edelstein, Asst Dir, Civil Works for N Atlantic Div, to Sen Charles McC. Mathias, Jr., 31 Mar 1971. Recs of Baltimore Engr Dist; Mailing and Recs Br, box 174.

[27](1) Ltr, Gordon T. Atkinson of Crisfield to Hoxie, 5 May 1905, Rec Gp 77, entry 994, box 3. (2) Annual Rpt, C of Engrs, 11 Aug 1913, pp. 394-95.

[28]Ltr, Dent to Rep T. Alan Goldsborough of Md, 18 Nov 1936. Rec Gp 77, ACC 71A939, box 41.

[29]Rpt on Crisfield Harbor by Bd of Engrs for Rivers and Harbors, 17 Jul 1939. Rec Gp 77, ACC 71A939, box 41. (2) Annual Rpt, C of Engrs, 31 Aug 1948, p. 480.

[30]Ltr, Prentiss to Kenneth T. Mathews, Exec Dir, Delmarva Advisory Council, 6 Dec 1971. Recs of Baltimore Engr Dist; Mailing and Recs Br, box 173.

[31]Annual Rpts, C of Engrs, 8 Oct 1912, p. 353, 355; 11 Aug 1913, pp. 387, 389.

[32]William T. Stone and Fessenden S. Blanchard, *Cruising Guide to Chesapeake* 4th ed. Rev., (New York: Dodd, Mead & Co, 1973), p. 130. (2) Baltimore Engr Dist, "Draft Environmental Statement, Tred Avon River, Talbot Co, Md," (Apr 1972), pp. 1-2. Recs of Baltimore Engr Dist; Mailing and Recs Br, box 156.

[33](1) Annual Rpts, C of Engrs, 8 Oct 1912, p. 354; 5 Oct 1922, p. 534; 1968, vol. II, p. 196; 1971, vol. II, pp. 4-13. (2) During this latter project the District became enbroiled in a minor controversy over spillage of dredged material on the private property of George T. Harrison, a resident of Talbot County. On 17 February 1971, when the American Dredging Company began pumping spoil

into a designated area, a county-installed drainage pipe ruptured, allowing mud to spill out into the harbor in front of Mr. Harrison's property, causing shoaling. Harrison complained vociferously. Maj. Gen. R. H. Groves, North Atlantic Division Engineer, urged Baltimore District Engineer Col. Louis W. Prentiss, Jr., to personally look into the matter."I suspect that you have the makings of real trouble in this one," Groves wrote to Prentiss. "I wish that you would get into it personally and insure that we are doing the right thing." Ultimately, all sides agree that it was the Talbot County commissioners' responsibility to restore the offshore area fronting Mr. Harrison's property. "Local interests were required to provide suitable disposal areas," Colonel Prentiss observed, "and hold and save the United States free from claims for all damages. It is considered that because of the pipe failure the mud spill is the responsibility of the County Commissioners." Ltr, Groves to Prentis, 28 March 1972. (3) Rpt, Prentiss to Groves, 15 May 1972. Recs of Baltimore Engr Dist; Mailing and Recs Br, box 174.

[34](1)Stone and Blanchard, *Cruising Guide to Chesapeake*, pp. 234-38. (2) Annual Rpts, C of Engrs, 8 Oct 1912, p. 359; 11 Aug 1913, p. 394; 28 Sep 1915, p. 428.

[35]*Ibid.*, 28 Sep 1931, p. 477; 22 Sep 1932, p. 413; 11 Oct 1940, p. 434; 31 Oct 1941, p. 425; 6 Oct 1950, p. 414; 1957, vol. II, p. 293.

[36](1) *Ibid.*, 1971, vol. II, p. 14. (2) Ltr, Love to N Atlantic Div Engr, 27 Feb 1970. Recs of Baltimore Engr Dist; Mailing and Recs Br, box 156.

[37](1) Ltr Hains to Gillespie, 31 Aug 1901. (2) Ltr, Hains to Eastern Shore Telegraph and Telephone Co., 12 Aug 1901. Rec Gp 77, entry 985, vol. VIII.

[38]Lt, Brig Gen George B. Pillsbury, Actg C of Engrs, to Goldsborough, 1 Jul 1936. Rec Gp 77, ACC 71A939, box 49.

[39]Annual Rpts, C of Engrs, 29 Sep 1906, p. 201; 7 Aug 1907, p. 214; 29 Sep 1909, p. 230; 8 Oct 1912, p. 338; 28 Sep 1915, p. 394; 11 Oct 1921, p. 499; 4 Oct 1937, p. 348; 18 Oct 1938, p. 367.

[40]Ltr, Maj J. D. Arthur, Jr., Dist Engr, to S Atlantic Div Engr, 23 Nov 1931. Recs of Baltimore Engr Dist; Mailing and Recs Br, box 2.

[41]Annual Rpts, C of Engrs, 4 Oct 1927, p. 446; 22 Sep 1932, p. 418; 4 Oct 1937, p. 366.

CHAPTER IX

A Revolution in Civil Works: The Flood Control Act of 1936 and After

The Susquehanna River is the largest stream that through other waterways enters the Atlantic Ocean along the eastern coast of the United States. It is 444 miles long, rising in New York where as a small stream it leaves Lake Otsego at Cooperstown. It flows south through the many irregular valleys of Pennsylvania's Allegheny plateau thence across the eastern portion of that state, forming its own widening valley into northeastern Maryland and the Chesapeake Bay. Its Western Branch, about 200 miles long, rises in southwest central Pennsylvania and flows northeast and east across the state's central region to unite with the Susquehanna near Sunbury in Cumberland County. The Juniata River also connects the western part of Pennsylvania with the Susquehanna, entering the main channel at the town of Duncannon. With the Potomac River to the south, which also discharges into Chesapeake Bay, these streams form the major waterways that link the western half of Pennsylvania and the whole Ohio Valley as well as the eastern section of the Middle Atlantic region.

The Susquehanna River basin comprises four varied physical regions. The Appalachian plateau of southern New York and northern Pennsylvania is a rolling countryside where dairy farming is an important industry. By contrast, the eastern Allegheny plateau and mountain region have steep mountains and valleys that make cultivation difficult. The main industries are forest products and coal mining. The Appalachian ridge and valley region contains the anthracite coal territory of Pennsylvania, an area in sharp economic decline since the shift to use of other fuels during the 1920's and 1930's.[1] Here the broad valleys and high mountain ranges are half-forested. Finally, the slightly rolling hills of the northern area are highly developed in industry and general agriculture.[2]

Although the Susquehanna Valley is tapestried with majestic beauty, parts of the river's North Branch that flow through Pennsylvania's Wyoming Valley have been disfigured by the anthracite coal industry. During hard coal's heyday through World War I, coal dust and sulfur discolored the river and mountainous heaps of unusable coal waste known as culm piles lined the banks. Along the West Branch bituminous coal stripmining left the land defaced and scarred. The dumping of silt and acid from mines into streams for over a century, combined with the disposal of urban waste, make water pollution one of the basin's critical problems.[3]

During the nineteenth century, the Corps of Engineers left the Susquehanna River largely undeveloped. The only improvements to navigation in the basin were at Havre de Grace, Maryland, and on the North Branch near Wilkes-Barre, Pennsylvania. There was little pressure in the region for developing water transportation because most of the coal mines were owned by railroads which feared competition for freight from the river.

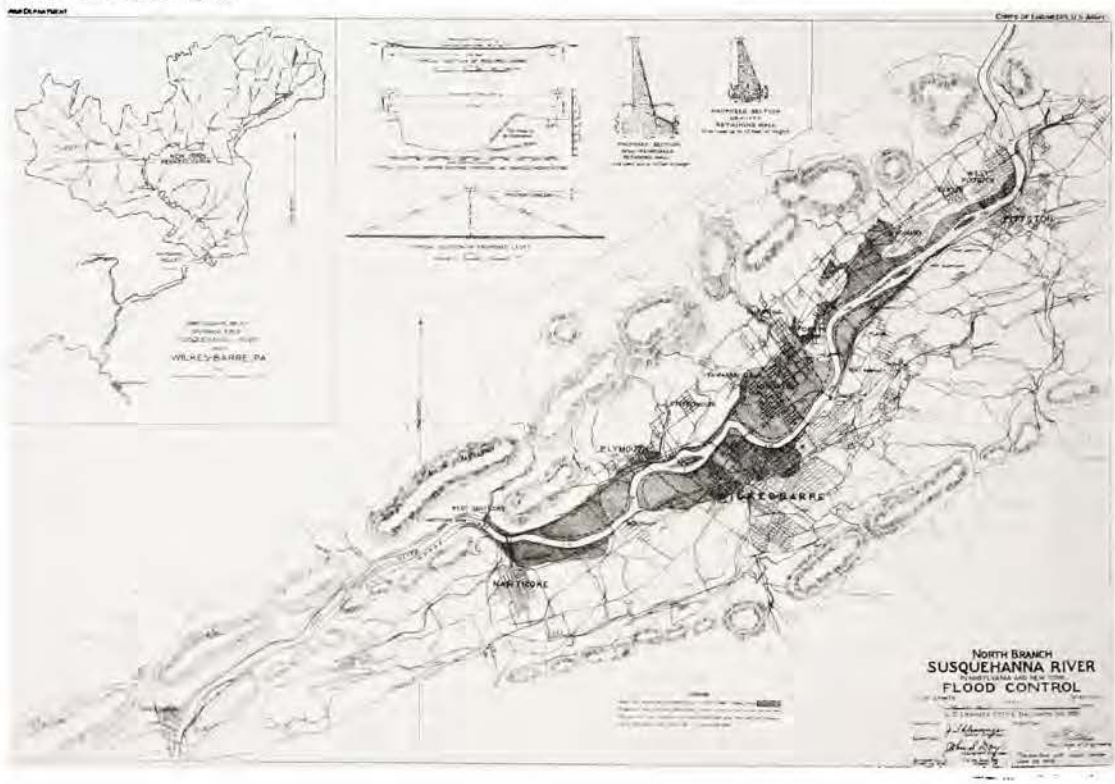
Through a monopoly on transportation, the seven major anthracite railroads of Pennsylvania, which the J. P. Morgan banking interests controlled through interlocking directorates, were able to keep freight rates artificially high, driving out of business the independent coal operators not tied to these railroads.[4]

In 1904, Secretary of War William Howard Taft ended future prospects for navigational development of the Susquehanna when he designated the waterway a non-navigable stream above Maryland, and directed the Chief of Engineers to allow the Pennsylvania Railroad to construct a bridge across the river at Havre de Grace. The effect of this decision was to close the Susquehanna as an interstate waterway. Now the Secretary of War could grant permission for building dams and bridges without the consent of Congress.[5]

In 1914 Pennsylvania Representative J. Hampton Moore tried unsuccessfully to convince Congress to revert the status of the Susquehanna to a navigable stream. He hoped the federal government, through a series of locks and dams, would transform the river into a massive water highway similar to the Mississippi River. "It is believed by many people," Representative Moore informed his colleagues, "that the development of the [Susquehanna] river for transportation purposes would have the effect of reducing the freight on coal a dollar a ton. In these days of high living cost such a reduction in the price of the essential fuel of the people would be most welcome . . . "[6]

But it was protection from flooding, not the improvement of navigation, that brought the federal government into the business of transforming the Susquehanna River basin. Floods had periodically plagued the residents of the Susquehanna Valley, sometimes resulting in catastrophe. Most damage had occurred during the spring months when melting snow combined with heavy rains swelled the river beyond its banks. Major flooding was recorded as early as 1692 and later in 1748 and 1794. On 18 March 1865 the raging Susquehanna almost washed Wilkes-Barre away. Pennsylvania's Wyoming Valley

The dark area on this Baltimore District map of June 28, 1926 shows the dangerous flood area on the North Branch of the Susquehanna River.—Library of Congress



was stricken with severe floods in December 1901, March 1902 and March 1904. In all three of these incidents, unusually heavy rains caused the snow to melt rapidly and the river to overflow to such an extent that bridges and railroad beds were washed away. During March 1904, muddy silt-ridden water inundated the entire southern section of Wilkes-Barre.

Reacting to these successive disasters at the turn of the century, business interests in the Wyoming Valley in 1902 formed the Susquehanna River Improvement Association to seek means to reduce future flood damage. However, it was the devastating floods of July 1935, and especially of March 1936, which thrust the Army Corps of Engineers into the planning and building of flood-control works on a massive scale.[7]

Actually the Baltimore Engineer District entered the field of flood control in 1914 when Congress authorized preliminary examinations of conditions on the Susquehanna River. The Baltimore District Engineer, Col. Lansing H. Beach, came to the Wyoming Valley with only a handful of men to study the causes of floods in the region. The Water Supply Commission of Pennsylvania loaned the Colonel a couple of men from its staff to aid in his investigation. The resulting report outlined concisely the reasons why high waters frequently threatened the valley, but Congress did not authorize Col. Beach to formulate detailed plans and cost estimates for flood-protection works.[8] Subsequently, in 1915, 1917 and 1925, Congress directed more detailed appraisals of the Susquehanna, including the control of floods. A six-man survey team gathered flood data on the north branch of the Susquehanna from June to September 1925, and in 1927 the Baltimore District Engineer, Maj. Charles R. Pettis, recommended a series of levees in connection with channel enlargement to protect the Wyoming Valley. At the same time he castigated the communities of the valley for constructing businesses and residences in hazardous places along the river. He said there was "a great indifference on the part of the individual and the public to the necessity of a waterway sufficient to care for floods. For either profit or convenience, there have been established residential subdivisions on areas subject to overflow."[9]

Beginning in August 1929, several field parties surveyed the Susquehanna and its tributaries to investigate navigation, water power and irrigation, with flood control receiving only minor attention.[10] The absence of disastrous flooding since 1904, however, did not allay the fears of some who lived along the shores of Pennsylvania's major streams. In 1933, the Scranton Chamber of Commerce urged the War Department to extend its study of the Susquehanna to include conditions in the Lackawanna Valley. "Works on flood control undertaken at this time would," the business community of economically depressed Scranton observed, "in addition to conserving property of great value . . . give employment to many men here abouts now without work because of the shutdown of many anthracite coal mines"[11] Nevertheless, the District's 1934 report on its surveys of these Pennsylvania streams played down the threat of potential flooding to the northeast Pennsylvania region. "As compared to power possibilities," the District Engineer, Col. Elliot J. Dent, noted in the report on the Susquehanna, "the flood protection projects considered are of minor importance. Flood protection projects on this river are all of strictly local importance. Damages under present conditions do not justify the cost of protective works except for 3 projects . . ." The three projects Dent referred to encompassed the construction of levees at Harrisburg, York and Wilkes-Barre with labor supplied under the Federal Emergency Relief Act from the Works Progress Administration.[12]

The flood of July 1935 and the heavier one of March 1936 moved flood protection to top priority. High waters inflicted extensive damage in July 1935, particularly in the upper reaches of the Susquehanna River in New York. But until Hurricane Agnes in June 1972, the torrents that raged through the Susquehanna Valley in March 1936 constituted the greatest disaster that had ever occurred in the territory within the jurisdiction of the Baltimore District. During the middle of the month rain fell for almost two weeks on melting snow, and the violent waters devastated the central Atlantic community. Flood damages in the Susquehanna basin alone amounted to about $67 million.[13]

During March 1936, the Susquehanna and the other streams of the basin crested twice within a week. On 13 March the Harrisburg

Patriot reported the grim news that "raging waters from numerous rivers and streams spread out over many sections of Pennsylvania last night, isolating many communities, blocking roads and railroads and flooding mines, factories and farms." The Juniata River spilled water onto farms all along its path. The flood routed families from their homes in lowland areas.[14] High water and mountain snow slides blocked roads throughout Pennsylvania. In Harrisburg, Wilkes-Barre, Kingston, Plymouth and Nanticoke, water covered the streets. Row boats delivered food and medical supplies to stranded flood victims. In Kingston several buildings collapsed while others leaned at precarious angles.[15] By 14 March the worst seemed to be over. Residents of the flood-torn state spent the next few days immersed in the laborious task of cleaning up and assessing damage. "The flood-soaked are presented a desolate picture," the Philadelphia *Inquirer* reported on 16 March, "as hundreds of property owners and occupants surveyed their losses." The destruction appeared most extensive in South Wilkes-Barre where the flood waters reached the second stories of many river-side homes. "Fences and hedges," the *Inquirer* continued, "had been carried away. Mud covered the first floor of homes, plaster had been soaked from the walls, (and) lawns and gardens were coated with mud a foot in depth."[16]

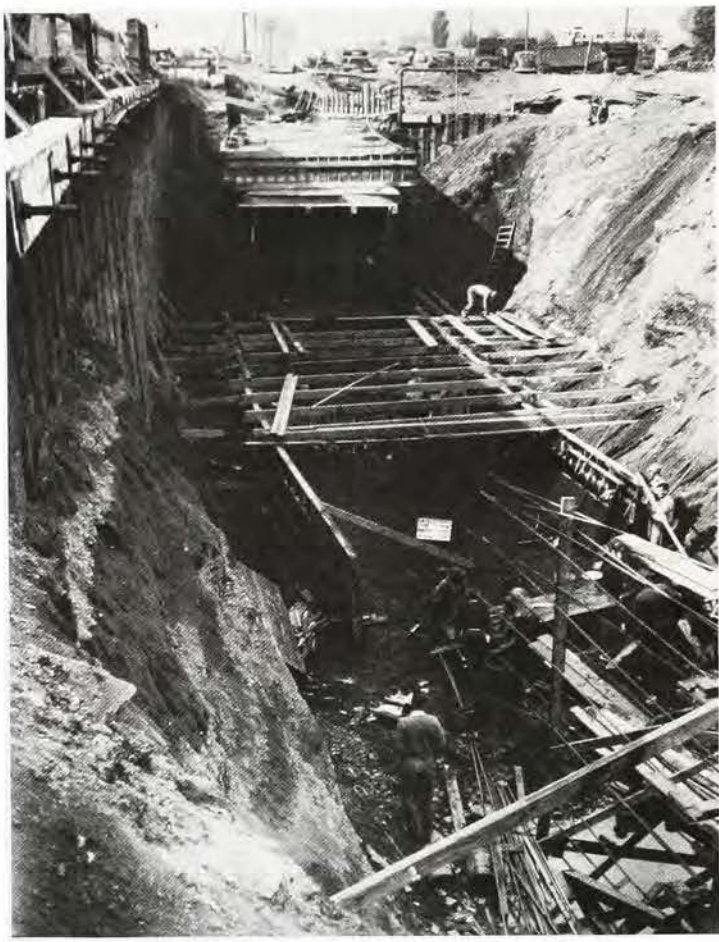
A few days later, rains dumped more devastation on an already scarred land. People who had just returned to their homes fled again from the rising water. On 19 March the Philadelphia *Inquirer* estimated the death toll at 100 with at least 100,000 homeless.[17] Along the West Branch, Williamsport, Lock Haven, Clearfield and Renovo were all isolated. At Lock Haven where Bald Eagle Creek joins the Susquehanna in the middle of town, back water from both streams filled the streets to a depth of eleven feet. At Sunbury, the raging Susquehanna River tore away a six-foot embankment that 400 Civilian Conservation Corps workers had toiled to build, and inundated two-thirds of the town. In the downtown business district water rose to the second stories of many buildings.[18]

In the wake of the catastrophe President Franklin D. Roosevelt allotted $43 million to the Works Progress Administration for flood relief. In a matter of days local WPA officials had 48,000 men throughout Pennsylvania clearing debris and mud from homes. The Works Progress Administration, the Pittsburgh *Press* editorialized, "maligned by critics, cursed even by its friends, weighted down with red tape—literally leaped to the aid

Upstream end of the levee designed to protect Wilkes-Barre from the Susquehanna's potentially dangerous flood waters, August 30, 1938. U.S. Army Corps of Engineers.—National Archives

of every agency greedy for its services and proved beyond doubt that, given a free hand, it can function efficiently, economically, and effectively."[19]

In the aftermath of the ruin, Congressmen from the flood-torn communities renewed pressure in both houses toward adopting a comprehensive federal flood-protection program for the Susquehanna River basin to be administered by the Corps of Engineers. Such a measure, involving constructing large dams in conjunction with erecting local flood-protection works such as levees, flood walls and pumping stations, had passed the House of Representatives in August 1935, only to be filibustered to death in the Senate by Senator Millard E. Tydings of Maryland. To Tydings, the federal government did not have the money to indulge in building dams and levees. "This is not a bill," Tydings told his fellow senators, "to make employment for people. This is a bill to make a deficit in the Treasury, to make a debt for future generations to pay, an unnecessary debt in most cases, although some of the projects may have individual merit . . . "[20] Now in the spring of 1936 the merit of those projects was of more concern to the senators than their cost. Pennsylvania's Senators James J. Davis and Joseph F. Guffey and New York's Senators Robert Wagner and



Construction of a tunnel designed to carry water under a levee included in the Kingston-Edwardsville local flood protection works, October 7, 1938. U.S. Army Corps of Engineers—National Archives

Royal S. Copeland all spoke out in favor of a National Flood Control Act. Heretofore federal responsibility for flood control had been confined to the lower Mississippi River. Senator Davis believed it was time for Congress to assure adequate flood protection on all the nation's major waterways.[21] "Conservation is making steady progress as our approved public policy." Senator Wagner wrote in the *New York Times*. "Now its extension to water," he concluded, "in the form of flood control should be given the attention of the American people, who already heartily endorse the forest and wildlife conservation activities of the Government."[22]

Representative Bert Lord of Afton, New York joined the parade of supporters for flood-control works. He urged that in the future Congress appropriate even more than the $15 million the Army Engineers recommended for southern New York in their last report. Mr. Lord chided the Senate for failing to enact the flood-control measure the House of Representatives had approved the previous year. "If we could hold back the water in New York State that comes down and overflows Wilkes-Barre, Harrisburg, and those other cities," he noted, "a great deal of that damage, if not all of it, could be prevented."[23] John E. Rankin, Representative from Mississippi, argued that the devastation recently wrought upon the Susquehanna should awaken "the American people to the necessity of a national program for the development of our navigable streams, to control their floods, protect our soil, improve navigation, and provide the people of this great country with unlimited supplies of cheap hydroelectric power . . . "[24] Representative Monrad C. Wallgren of Washington could not understand why the government could spend billions on unconstructive programs such as manicuring highways and raking leaves while neglecting flood control.[25]

Levee embankment with partially completed rock paving at Williamsport as it appeared on May 12, 1948. U.S. Army Corps of Engineers—National Archives

Finally, Senator Royal S. Copeland, Chairman of the Committee on Commerce, which had charge of the Flood Control Bill, pressed for quick action on the legislation "in order that the two Houses may agree in conference as to the final form of the bill and that the Army Engineers may proceed with the work."[26] With visions of mud, debris and washed-out homes fresh in their minds, the Senate by voice vote passed the National Flood Control Act on 21 May 1936. During the first week in June both houses agreed to the conference report on the bill.[27]

Adoption of this legislation made the Corps of Engineers the main government agency responsible for flood protection on the nation's waterways. Thus began a huge expansion of the Corps' civil-works functions, from basic navigation control to constructing multipurpose dams, levees and flood walls. In particular, the legislation authorized the expenditure of $27,154,000 on flood control in New York and Pennsylvania. In addition, President Franklin D. Roosevelt, after an inspection tour of the flood's destruction, allocated more than $2.5 million in special emergency funds to be used by the Army Engineers who were to use members of the Civilian Conservation Corps and other kinds of relief labor.[28]

II

Since 1936, the Baltimore District of the Army Corps of Engineers has changed the landscape of the Susquehanna River basin. Through a combination of local flood-control projects consisting primarily of constructing levees and flood walls and building huge dams and reservoirs, there have been more than 100 flood-control projects in the Susquehanna River basin. In Pennsylvania these projects have covered the entire length of the Susquehanna River including its West Branch as well as the Juniata and Lackawanna Rivers.

In August 1936, the District established an area office at Kingston, Pennsylvania, to closely supervise flood-control projects in the Wyoming Valley. In 1937 levee construction began at Kingston, Edwardsville and Hanover, and the District, in conjunction with the Works Progress Administration, took charge of the work started in 1935 at Wilkes-Barre. Although flood protection was the primary purpose of these projects, a useful corollary was economic relief for the unemployed left destitute by the Depression of the early 1930's. Needy professional and clerical workers found jobs as laborers, surveyors and technicians. At Kingston, in order to provide immediate relief for the unemployed, construction began with funds from the Emergency Relief Act of 1936 before complete subsurface, design and hydrological conditions were determined.[29] Construction had to be suspended on all these projects during World War II, but the District completed them during the immediate postwar years.

In the Wilkes-Barre–Hanover area, the Corps built 24,660 feet of earth levees, 160 feet of concrete walls and eight pumping stations at a cost of nearly one million dollars.At Kingston-Edwardsville, on the west bank of the Susquehanna opposite Wilkes-Barre, the Baltimore District constructed levees 18,429 feet long.[30]

Construction Crew building the flood wall to protect Sunbury, Pennsylvania, July 14, 1948. U.S. Army Corps of Engineers—National Archives

By 1940, work on other local flood-control projects in the Susquehanna River basin was under way. At the borough of Plymouth in the Wyoming Valley building began in August on a system of earth levees, two pumping stations and appurtenant drainage structures. The District finished the levee portion of the project before World War II and what remained in 1948.[31]

Christopher F. Pfrommer was in charge of laying out the levees in the Wyoming Valley. He spent more than thirty years with the Baltimore District, much of it as head of its Engineering Division. He did much of the surveying himself, using borrowed instruments and assistants loaned from local municipalities. Although construction of levees in the towns of the Wyoming Valley proceeded smoothly, some residents in Wilkes-Barre protested that the embankments destroyed their scenic view of the river. Finally, the Corps and local interests reached a compromise to grade the levees with a gentle, grass-covered slope that would ameliorate the harsh appearance. The most vexing problem the District faced in the Wyoming Valley, however, was the subsidence of levees caused by the weakness of the ground which was a by-product of the years of extensive mining of anthracite coal. Emergency repairs became necessary at Kingston-Edwardsville and Wilkes-Barre, where in some places the levees fell as much as three feet.[32] At the town of Pittston, north of Wilkes-Barre, the bottom completely collapsed in the Susquehanna River into a deep mine shaft. After several weeks the hole still had not been plugged, so the Corps decided to try to stop the water from flowing into the mine by dropping old freight cars into the cavity. Cranes dumped hundreds of cars into the hole, finally clogging it sufficiently to prevent a further massive cave-in and to allow the river's water to resume its normal course. F. R. Deland of the Construction Division went into the mines afterward and noted that he could see the wheels of the freight cars sticking through the ceiling.[33]

At Williamsport, Pennsylvania, the county seat of Lycoming County on the West Branch of the Susquehanna, construction began in December 1940 on earth levees, concrete flood walls, pumping stations and appurtenant facilities and was completed by 1956 at a cost of more than $13 million. The Corps of Engineers in a 1930 report originally recommended the construction of flood-protection works for Williamsport. In 1935, Pennsylvania Representative Robert F. Rich campaigned for a federal levee project for the city to fortify it against high water and to provide needed work relief.[34] This important industrial center that produces steel, leather and plastics had a long history of flood damage. In May 1946, ten years after the disaster of 1936, another flood wrecked the city. Had the protective works been built before 1936, the Corps estimated, they would have more than paid for themselves during these two floods which occurred within a ten-year period.[35]

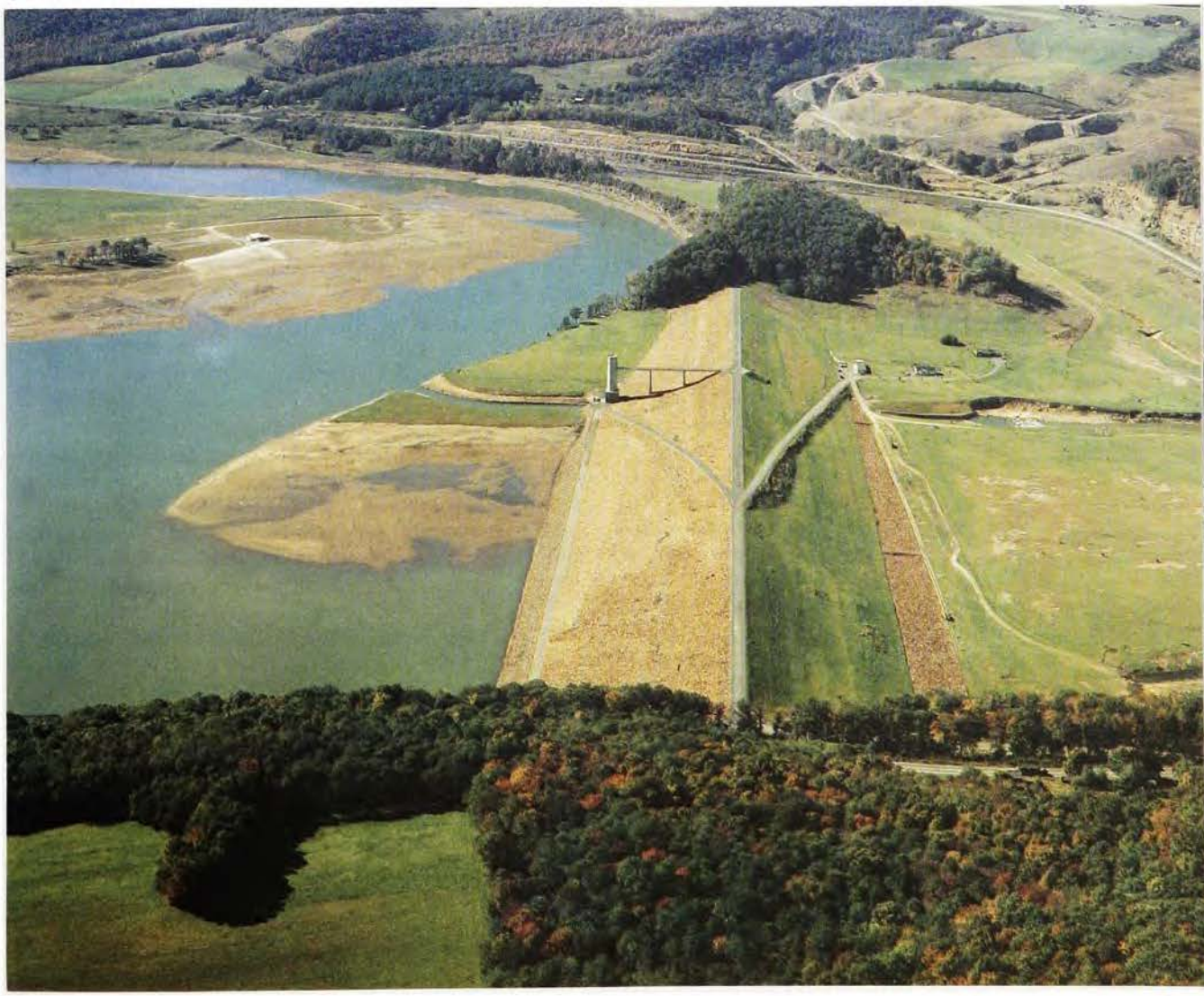
The flood-control project to protect York, Pennsylvania, situated on a small tributary of the Susquehanna River, called Codorus Creek, necessitated constructing Indian Rock Dam and improving the channel that runs through the city. The worst flood in the city's history struck in August 1933, when a hurricane followed a northeaster which saturated the watershed. Construction on the 1,200-foot-long earth and rock-fill dam rising eighty-two feet above the stream bed started in 1940 and was designed to prevent future damage. Contractors had the dam operational in 1942 and by 1947 had finished channel improvements consisting of widening and deepening, protecting the bank slopes, and removing a mill dam.[36] These improvements proved decisive during Hurricane Agnes of June 1972, when the dam reduced the peak flow at York about forty percent. As the chief of the District's Engineering Division noted, "Without the dam or channel improvements, the 1972 flood in York would have been about 13 feet higher than it actually was, and about 8 feet higher than the 1933 flood."[37] After completing the Indian Rock Dam the government instituted a policy of outleasing the dam's land for farming and grazing. The Corps granted the Pennsylvania Game Commission a license for 1,539 acres of land for wildlife conservation and management.[38]

After World War II, major and minor new projects began at many other sites along Pennsylvania's Susquehanna. Work at Harrisburg had been authorized by the Flood Control Act of 1936, but the town was divided over the feasibility of flood-protection plans, so in 1945 the mayor and city council indefinitely deferred assurances of local

cooperation.[39] Residents of Sunbury, on the upper Susquehanna River, were likewise split into factions over building flood walls in their town. However, enough people remembered the flood of 1936 to assure local cooperation. Between 1947 and 1951, the Corps supervised the construction of levees, flood walls, interceptor sewers and three pumping stations at the town and on Shamokin Creek.[40] At Swoyersville and Forty Fort, local flood-protection plans approved in 1936 were delayed because of the inability and unwillingness of those communities to provide the necessary rights of way for the project.

Alvin R. Bush Dam

Curwensville Dam



Finally, between July 1953 and May 1957, the Baltimore District managed the construction of levees in four phases at a cost of more than $2 million.[41]

III

For the West Branch of the Susquehanna River, Congress in 1954 authorized the Corps of Engineers to construct three major dams designed to reduce flood damage in the basin. The Commonwealth of Pennsylvania was already building a dam on the West Branch on Sinnemahoning Creek which it completed in 1956. This state dam would operate in conjunction with the three federal projects to secure optimum flood-control benefits.

No person was more instrumental in the constructing the Susquehanna's major dam projects than James P. Weaver, who began working for the Baltimore District during the mid-1930's. Mr. Weaver started his career as an inspector of pumping-station construction at Wilkes-Barre. After World War II he helped supervise the excavation of dams at Whitney Point, Almond Lake and East Sidney, and also was in charge of flood-wall construction at Lisle and Elmira, all in New York. He became resident engineer for the Stillwater Dam in 1958 and from that time on was resident engineer for every major dam constructed in the basin until he retired in 1973. He was the resident engineer from ground-breaking to completion for federal dams on the West Branch as well as the Raystown Dam on the Juniata River.[42]

Of the three projects on the West Branch, work started first on the dam at Kettle Creek in Clinton County, Pennsylvania. Surveying was an arduous task because of rugged terrain, snow and subzero temperatures during the winter, and snakes during the summer. The Kettle Creek project was the last major reservoir in the District where its employees made property-line surveys. On all subsequent projects the District contracted such surveys to private firms.

The government purchased 1,273 acres for the dam, forcing the relocation of eighty-nine residents of the valley and eleven cemeteries. David P. Deland and other employees of the District's Real Estate Division oversaw the transfer of the 478 grave sites. The oldest log house on Kettle Creek, an 1863 structure, was moved to a new site above the intended water line.

The ground-breaking ceremony was held on a windy and chilly 16 May 1959. Some 150 persons witnessed the affair as Congressman Alvin R. Bush of Pennsylvania's 17th District pushed the plunger that detonated a dynamite blast that inaugurated construction. The dam was to be twenty-five feet wide at the top and 1,350 feet long, rising 165 feet above the streambed. Besides serving as a flood-protection facility, it would provide a recreation reservoir covering 160 acres.[43] Planning engineer David D. Congleton directed most of the dam's structural, mechanical, electrical and hydraulic design. After construction began it moved rapidly and was essentially completed in January 1962, a year ahead of schedule.[44] Since Kettle Creek is in a remote wilderness area of Pennsylvania, the contractor had to haul in heavy-equipment and material over narrow winding roads suited only to light traffic. Transporting supplies to the site became further complicated when an ice jam washed away a state bridge below the dam. Thereafter, to carry supplies to the construction site, the contractor had to ford Kettle Creek during low water.[45]

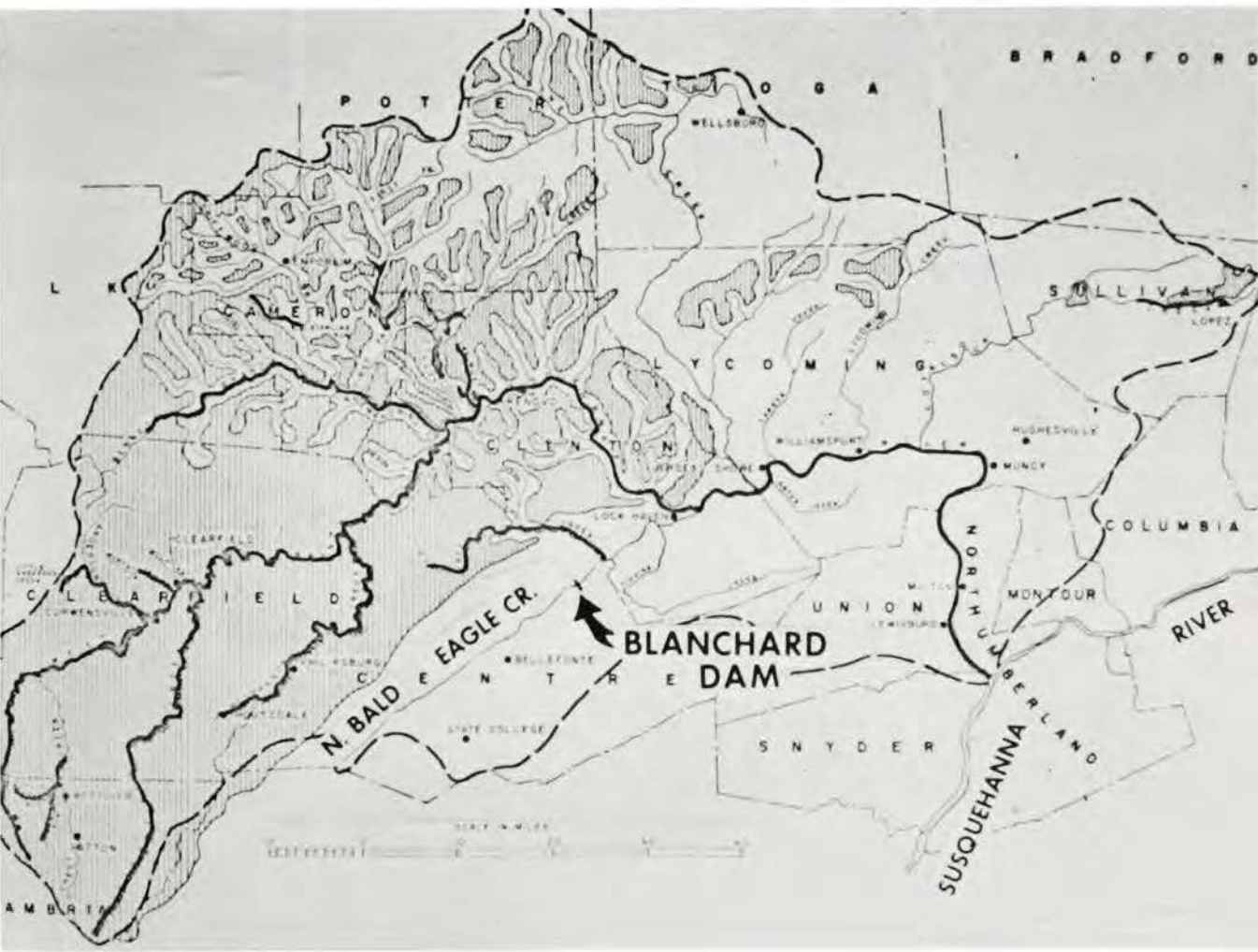
At the dedication ceremony on 8 August 1962, the dam was officially named for Representative Alvin R. Bush who had died of a heart attack in November 1959. Flood-protection from the reservoir is provided by closing the gates of the outlet tunnel during high water and storing the flood waters for release until the flood crest has lowered. But the Baltimore District Engineer, Col. Warren R. Johnson, warned in a speech at the dedication ceremonies that dams alone did not guarantee protection from raging flood waters. Careful flood-plain management was mandatory. Encroachment into the flood plain, he cautioned, could prove disastrous. "By moving into the flood plain where earlier commercial or residential developments were unsafe," Colonel Johnson concluded somberly, "these communities find themselves with a second undesirable and dangerous situation to replace the one they just erased."[46]

The first test for the dam came during the heavy rains of March 1964. Unfortunately, seepages occurred in the structure where the embankment meets the ground. During the crisis workers checked the leaks with burlap covered with chicken wire and weighted with rocks. As the water receded with the coming

of summer the engineers drilled holes and pumped mortar into the seepage area to prevent a recurrence.[47]

The Curwensville Dam in Clearfield County, Pennsylvania, became the second major structure the Baltimore District built on the West Branch of the Susquehanna River. Although the citizens of the area wanted flood protection, many favored the building of numerous small dams instead of one large structure which would inundate vast areas of the best land. But the Corps of Engineers, backed by the Susquehanna River System Control Association, successfully pressed for funds for a large dam which Congress had already approved. Because the reservoir would flood parts of the small boroughs of Lumber City, Bells Landing and Curry Run, and sections of the reservation of the Seneca Indians, including 119 homes and twenty-three farm buildings, resistance to land acquisition became intense. However, petitions and protests failed to stop the displacement.

In addition, the dam construction required railroad relocation which presented engineering and environmental problems. After studying nine possible routes for the tracks, Neil W. Bond, Chief of Relocations for the District, came up with the idea of running the railroad on the course of the dam's spillway. This would allow the railroad to cross the dam without raising the road bed to heights that would have forced a lengthening of the track.



The District adopted the plan and built a shelf fifty-feet wide and five feet above the spillway crest, saving about twenty-five feet of elevation. Below the dam, the railroad rerouting was not so satisfactory. There, despite protests by the Borough of Curwensville and the local Lions Club which administered the park, the new track cut through a swimming-and-picnic area on the river's bank.

Construction of the roll-fill earth dam, designed to be 2,850 feet long and rise 131 feet above the stream bed, began on 6 May 1963. Excavation of the outlet channel that would carry the river through the dam started during the summer. The channel was to be cut through a spur of land near the left side of the dam, going through the dam site and reemerging at the river at the lower end of the spillway. Creating this cut required blasting through fifty feet of rock. By November 1965 the entire project was in operation. Since then, as at the Alvin R. Bush Dam, the Commonwealth of Pennsylvania has developed and maintained a recreation site at the reservoir that includes picnic grounds, a beach and boat areas.

At the time the dam was planned, the

Foster J. Sayers Dam

water in the West Branch was polluted with acidic mine wastes and could support no fish upstream from Lock Haven. Since then, the Army Engineers have been able to use the dam to control the flow of the acid water downstream and this, combined with increased state efforts to curb mine waste, has brought fish to the reservoir.[48]

In May 1966 construction started on the final federal dam on the West Branch on Bald Eagle Creek in Centre County. The endeavor required relocations of railroad track and a highway, and moving four cemeteries and the facilities of two telephone companies and one power company. Protests against construction emanated from some large dairy farmers in the area who lost their land and from the Borough of Howard located below the projected reservoir's highest elevation. The town faced the choice of obliteration or relocation. In order to avoid either unappealing alternative the Corps finally decided to erect a dike around Howard to protect it from the reservoir.

Conduit construction in Elmira, New York, August 8, 1947. U.S. Army Corps of Engineers—National Archives

Because the water flow of Bald Eagle Creek is limited, and in order to maintain the reservoir pool at a sufficient height—especially during the summer months when the lake would be used for water sports—the foundation of the dam had to be particularly free of seepage. Resident Engineer James P. Weaver paid special attention to foundation grouting in order to obtain near-zero seepage. By coordinating the foundation grouting with the embankment construction he avoided any unusual expenses or delays.[49]

The army dedicated the 6,835-foot facility in July 1969, naming it in honor of Pfc. Foster J. Sayers, the only World War II Medal of Honor winner from Centre County, who was killed in action in France in 1944. Recreation facilities provided by the 1,730-acre reservoir include power-boating, swimming and camping.[50]

Aesthetically, all three reservoirs have been triumphs. Their banks have been beautifully landscaped to cover extremely ugly strip-mining scars. The results have improved the region's scenery to produce outstanding attractions.[51]

IV

After the devastating floods of 1935 and 1936 the Corps of Engineers began constructing flood-protection works in the upper Susquehanna basin in southern New York. The overall plan for alleviating the threat from floods outlined in the Flood Control Act of 1936 envisioned a combination of thirteen local-protection projects and seven reservoirs in New York. The Syracuse Engineer District managed the building of these flood works until November 1946, when the Southern New York Flood Control Project came under the Baltimore District's jurisdiction. With the inactivation of his district, Col. John S. Seybold, Syracuse District Engineer, moved to Baltimore. He performed admirably the

difficult task of coordinating personnel consolidations of the two districts and gave his expertise about the New York projects to the Baltimore office.[52] The entire Susquehanna River basin has remained the responsibility of the Baltimore Engineers except between 1955 and 1960, when the New York Engineer District controlled the flood-protection structures in New York State.[53]

Altogether, four of the seven reservoirs and twelve of the thirteen local flood-protection projects had been completed at a cost through 30 June 1968 of more than $41 million. The local operations encompass channel realignment, levee and flood-wall construction and the building of pumping stations at the New York towns of Oxford, Lisle, Whitney Point, Binghampton, Elmira, Corning, Painted Post, Addison, Bath, Avoca, Canisteo and Hornell. The four reservoirs include East Sidney, Whitney Point, Arkport and Almond. The Arkport Reservoir is on the Canisteo River near Hornell and was the first of the four completed, becoming operational in November 1939. It consists of an earth-filled type of dam 1,200 feet long that rises 100 feet above the streambed. It is the only dam in the basin that has no gate, the normal flow of the stream passing through a tunnel at the right abutment. Paul J. Jones, who worked on the New York projects for the Syracuse District and later came to Baltimore in the Construction Division, noted that the only real construction difficulty at Arkport was in excavating the spillway. The shaly composition of the rock weathered badly, necessitating the use of more concrete on the spillway than anticipated.[54]

The reservoir completed at Whitney Point in 1942 is much larger than the Arkport structure. This earth-filled dam is 4,900 feet long, rising ninety-five feet above the river. Construction began in September 1938 and proceeded around the clock. The contractor worked his crews in three 8-hour shifts with only an occasional period off for equipment maintenance. Of course, the Corps had to have three teams of inspectors to manage the progress. Almost immediately after the start of operations workers discovered that the foundation of the dam site was not as solid as originally believed. Below the surface they found "rock flour," a semi-solid material that becomes mushy when wet. The next spring the engineers decided to have the rock flour removed before proceeding. Otherwise, building the dam caused no unusual difficulties or mishaps. The $5.5 million dam controls a drainage area of 255 square miles.[55]

After World War II, the Baltimore Engineer District supervised construction of the Almond and East Sidney reservoirs. The Almond Reservoir, which had become operational by 1949, is an earth dam, ninety feet above a sharp bend in Canacadea Creek, and 1,260 feet long. Although there were no unusual construction or engineering challenges associated with the excavation of Almond Lake, that project marked James P. Weaver's entry into supervising dam-building. The East Sidney Dam which became operational in 1950, is unique because it is the only one of the four New York dams that is not exclusively earth-filled. Seven hundred fifty feet of its 2,000-foot length are concrete gravity. The entire structure stands 128 feet above Ouleout Creek and provides flood protection for Binghamton and other communities in southern New York and eastern Pennsylvania.[56]

All these reservoirs were used only for flood control until the 1960's. Then the Baltimore District began examining the completed water resources projects within its jurisdiction with the aim of expanding recreational facilities. As a result, the Corps of Engineers combined with New York State and local county agencies to build swimming, boating, fishing and picnic areas as well as access roads and parking space at Whitney Point, East Sidney and Almond reservoirs. Thus, a cooperative effort between New York and the Corps of Engineers transformed these reservoirs into scenic lakes that added an important corollary benefit from the original flood-protection motivation for construction.[57]

The Flood Control Acts of 1954 and 1958 authorized new flood-protection projects for the upper Susquehanna basin in Pennsylvania and New York. The 1954 Act provided for channel improvement and levee construction at Endicott, Johnson City and Vestal, in New York. The Corps substantially completed these operations by May 1961.[58] The 1958

Almond Lake →

flood-control legislation passed in Congress with little difficulty, but President Dwight D. Eisenhower vetoed the bill in a budget-balancing effort and on the grounds that it authorized some unsound projects the Executive Branch had not recommended. The veto message made no mention of particular projects.

Senators Hubert H. Humphrey of Minnesota, Ralph Yarborough of Texas, and Estes Kefauver of Tennessee sharply criticized the veto in the conviction that such public-works legislation was essential for bringing about recovery from the economic recession of that year. Senator Humphrey argued that what was needed was more spending on public works, not less. Yarborough thought the veto had anti-conservationist implications and reflected a retreat from national planning on the use of national resources. He rebuked the veto as an example of "futile fumbling over the problems of our natural habitat and our environment." Later, in June, both houses of Congress passed and the President signed a slightly scaled-down version of the earlier flood-control bill. For the Susquehanna River basin the Act authorized constructing detention reservoirs at Cowanesque and Tioga-Hammond in Pennsylvania, local flood-protection works at Elkland, Pennsylvania and Nichols, New York, and channel improvements at Cortland, New York.[59]

The Cortland operation provided for channel dredging of the Tioughnioga River, a tributary of the Chenango which joins the North Branch of the Susquehanna River at Binghamton. The Engineers did most of the necessary excavation during 1962 and 1963. Building a 14,000-foot levee at Elkland on the Cowanesque River about twelve miles above its confluence with the Tioga occurred between 1964 and 1968. Levee construction at Nichols, at the junction of Wappasening Creek and the North Branch of the Susquehanna, deferred because of lack of funds, reached the contract stage in July 1970 and was completed in October 1971.

Since 1972 the Baltimore District has been occupied with one of its biggest reservoir projects at Tioga-Hammond near the junction of Crooked Creek and the Tioga River at Tioga, Pennsylvania, about eighteen miles south of Corning, New York. Of course, as with all of these operations, extensive planning went into the project long before the actual start of construction such as aerial mapping, subsurface exploration, general design and land acquisition. The enterprise required building two dams: the Tioga Dam 2,600 feet long on the Tioga River and the Hammond Dam 5,000 feet long on Crooked Creek with an interconnecting diversion channel. The reservoir will provide a storage capacity of 130,100 acre-feet, and it is estimated that the final cost of the dams will be $70 million or more. The Tioga-Hammond Lakes project is designed to lower flood crests at Tioga and Lawrenceville in Pennsylvania and Corning and Elmira in New York, as well as communities downstream on the Susquehanna River in Pennsylvania.[60]

V

The Baltimore Engineer District has also erected flood-control structures along the Juniata and Lackawanna Rivers in Pennsylvania. The Lackawanna River, springing from lakes and swamps of the anthracite country, flows into the North Branch of the Susquehanna River. The first Corps project on this tributary was the construction of the Stillwater Dam in Susquehanna County about four miles north and upstream from the town of Forest City. Congress originally approved building the dam in 1941, but construction did not begin until some years later, spurred on by the flooding resulting from Hurricane Diane in August 1955.

Hurricane Diane hit Scranton particularly hard. In response to the disaster and to manage clean-up operations, the Baltimore District opened a special office in the Veterans Administration building in Scranton. It negotiated a series of contracts for restoration which was finished in about six months.[61] To provide Scranton future protection, in May 1958 the District started construction on Stillwater Dam. The Engineers built the dam in the middle of a water-supply reservoir owned by the Scranton–Spring Brook Water Service Company. This necessitated fabricating a temporary filtration plant downstream from the damsite to remove sediment stirred up during construction so that drinking water capacity would not be restricted.

During 1958 dramatically changing weather hindered building the 1,700-foot earth-fill dam. Extreme heat throughout the

Stillwater Dam

summer forced a slowdown. On 1 July the temperature hit 102° F. In contrast, the winter was frigid, the mercury dropping to 19° below zero on December 21. The cold weather froze the pipe system of a stream plant being installed to cure poured concrete. In addition, heavy rains during September and November prohibited the proper placement of earth on the dam embankment.

During the spring of 1960, the Lackawanna River, fed by melting snow, reached flood stage at Stillwater Dam, forcing the contractor to evacuate machinery and office equipment. The reservoir crested at forty-three feet on 5 April, submerging the contractor's field office. Workers spent the rest of the month cleaning up the damage, making repairs and pumping water from the spillway. Excavation and embankment work resumed in May and continued through the summer. Despite all these setbacks the Stillwater Dam began operations in September, two months ahead of schedule. Landscaping continued until the end of the year.[62]

Later Corps projects in the Lackawanna basin, authorized in 1962, entailed local flood-protection works at Scranton and building a 1,270 earth and rock-fill dam on Aylesworth Creek about a mile above its confluence with the Lackawanna in Lackawanna County. Between 1966 and 1969 the District managed the building of levees, a concrete flood wall and a pumping station at Scranton. Construction on Aylesworth Dam began in November 1967 and was concluded three years later. The project area included no dwellings, cemeteries or railroads, so the only necessary relocation involved power and water lines. It is a self-regulating dam, its excess water automatically discharging through a conduit pipe.[63]

The District's most important mission on the Juniata River began in November 1968,

when construction started on a dam on the Raystown Branch of the Juniata River about ten miles south of Huntingdon, Pennsylvania. The dam had been in the works since 1941, but never got off the ground. The original plan for the project provided for a multi-purpose structure to furnish not only flood protection but also electrical power. This would have made the dam the first federal power project in northeastern United States. Private power interests mounted tremendous opposition. During postwar replanning for the dam, designers focused on flood control and recreation but included a dam large enough to generate power in the future if necessary.[64]

Of course, before any dam can be built the government must purchase the necessary land. In the case of Raystown this required the largest real-estate acquisition in the history of the Baltimore District, involving 1,600 separate tracts. The District set up a special real-estate office in Huntingdon to handle all property transactions. The government acquired the largest portion of the land for the dam site from the Pennsylvania Electric Corporation.[65]

The project, completed by June 1974 at a cost of more than $70 million, consisted of a dam rising 225 feet above the streambed and controlling 960 square miles of drainage area. But even before the dam had been finished, it

Raystown Dam

had proved its value in damages prevented during Hurricane Agnes, according to the District Engineer, Col. Louis W. Prentiss, Jr. He termed the Raystown Dam "the right dam at the right place at the right time . "[66] The water rose rapidly on the Juniata, but it never topped the partially completed rock-filled dam. Following the storm the Corps resumed construction after removing trees and parts of buildings that were floating in the river.

The Raystown Lake project is the largest recreation area in the charge of the Baltimore District. The original design provided for extensive facilities for boating, camping, picnicking, fishing and swimming. Many of these recreation sites are now in use while others are still being constructed. Raystown Lake is the only project within the District's area where the Corps itself runs the recreational facilities. The District employs a large staff of rangers and maintenance crews to accommodate the many visitors.

Thus, since 1936, the Susquehanna River basin has been fortified throughout against raging flood waters. But these flood protection works have become a mixed blessing. For example, the dams on the Susquehanna have affected the density of striped bass (rockfish) in Chesapeake Bay which depends upon a huge fresh-water flow from the Susquehanna to provide the necessary spawning chemistry and to keep the eggs of the fish moving.[67] Also, these levees, flood walls, pumping stations, dams, reservoirs and flood gates cannot guarantee complete protection. The unparalleled magnitude of Hurricane Agnes in June 1972 proved that vulnerability continued. Although these flood works have prevented vast extents of personal and property damage, there is a danger that they can create a false sense of security. Large dams are not the only answer to flood control; wise flood-plain management is essential. Allowing people and industry to move into flood-threatened areas diffuses much of the protection provided by flood-control structures. Finally, it is important to realize, as the Susquehanna River Basin Study states, "floods are a natural phenomenon and no amount of protection and management can eliminate damages completely."[68]

VI

The Baltimore District has also been actively engaged in building flood-protection projects outside the Susquehanna River basin. Since absorbing the Washington District in 1961, these have encompassed works in the Washington region and in the Potomac River basin in western Maryland and West Virginia.

At Forest Heights in Maryland on Oxon Run at its confluence with the Potomac River in Prince Georges County, the District managed the construction of a 1,500-foot earth levee and channel improvement to prevent floods caused by silting.[69] In western Maryland, at the bituminous coal mining town of Kitzmiller in Garrett County, there had been seven destructive floods since the town's incorporation in 1906. Before the advent of the automobile, it was imperative that the miners live within easy access of their work. Therefore, the town sprang up in a flood-plain gorge 400 to 600 feet deep on the North Branch of the Potomac River at the source of the coal. The entire business district and one half of the residential area of Kitzmiller is in the flood area. During the flood of March 1924, an entire family of five drowned. Finally, in 1963 and 1964, the Baltimore District built a 5,800-foot levee and a thirty-foot retaining wall to alleviate the constant threat posed by the rising waters of the Potomac.[70]

Also on the North Branch of the Potomac River, local flood-protection works at Cumberland in Maryland and Ridgeley in West Virginia, about 197 miles upstream from the nation's capital, revolved around levees and channel excavation. Contractors accomplished most of the work between 1949 and 1959 with minor channel renovation in 1963 with funds supplied by the Area Redevelopment Administration of the Department of Commerce.[71] At the small mining and milling town of Bayard, on the right bank of the North Branch of the Potomac River at its confluence with Buffalo Creek in Grant County, West Virginia in the Allegheny Mountains, raging waters did extensive damage in 1883, 1924, 1936 and 1954. The Corps managed levee, flood-wall and channel construction between 1961 and 1964 that was designed to give the town more security from high waters.[72]

The District's largest mission on the North Branch of the Potomac began with construction of the Bloomington Reservoir in June

1971 on the state line between Garrett County, Maryland and Mineral County, West Virginia. When complete, the dam will be a combination of rolled earth and rock fill standing 296 feet above the streambed with a length of 2,050 feet. The reservoir will extend longer than six miles upstream and inundate 965 acres to control a drainage area of 263 square miles. During preconstruction planning, foundation exploration and design, the Omaha District aided the Baltimore District by preparing the design memorandum for the outlet works, and the New England Division did the same for the spillway. The first construction contract provided for the relocation of the Western Maryland Railroad. The anticipated cost of this huge flood-control and water-supply facility is more than $100 million, one-third of which is to come from non-federal reimbursement.[73]

In the Washington, D.C. vicinity the Corps of Engineers has begun flood-protection works on the Anacostia River, on the West Branch of the Patuxent River in Upper Marlboro in Maryland and at Four Mile Run in Arlington, Virginia. The Washington District in November 1961 completed channel improvements of the Anacostia River and levee construction on both banks to protect Bladensburg, Edmonston, Riverdale, Cottage City and Colmar Manor in Maryland. Since that time the Baltimore District has drawn up plans and specifications for channel realignment and deepening of the Anacostia River and its tributaries in Prince Georges County in Maryland, northeast of Washington, D.C.[74] On the West Branch of the Patuxent River, while the Maryland State Road Commission altered the inadequate openings of two highway bridges, the Corps supervised channel improvements, floodway clearing and levee and drainage construction.[75]

The banks of Four Mile Run at Arlington and Alexandria in Virginia overflow during most steady rains. Local governments and residents have talked about the problem for years but lacked the resources to provide a solution. Finally, Congress authorized a federal project and, although the impoundment of funds by President Richard M. Nixon delayed construction, work began during the summer of 1974 on a levee and flood-wall protection system with interior drainage facilities, an improved channel, and replacement of bridges for two highways and four railroads. Under provisions of authorization local governments are required to prevent unwise future development of the flood-plain area.[76]

VII

The Flood Control Act of 1936 is a landmark in the history of the Corps of Engineers. That year marked a turning point for its operations in civil works from involvement mostly in navigation improvement to large-scale control of the nation's waterways through dam and levee construction and river-basin planning. This has been particularly true for the Baltimore District because of its broad geographic responsibility over the Susquehanna, Potomac and Chesapeake basins. Not only has the magnitude of the projects increased since 1936; so has their influence over the landscape and the environment. Thus, the 1936 Act revolutionized the civil-works functions of the Corps of Engineers, charging the agency with developing water resources throughout the country.

Footnotes to Chapter IX

[1]On the decline of the anthracite industry, see Harold K. Kanarek, "Progressivism in Crisis: The United Mine Workers and the Anthracite Coal Industry during the 1920's." Ph.D. dissertation, Univ. of Va., 1972.

[2]Frank Burggraf, Jr., and William G. King, *Susquehanna River Basin: Natural Resources and the Future* (prepared for Dept of Interior, Nat Park Serv, 1967), pp. 8-9.

[3](1) Jacob W. Gruber, Anthropology Dept, Temple Univ., "An Archaeological Survey of the Valley of the West Branch of the Susquehanna River between Mahaffey and Curwensville, Pennsylvania" (Oct 1964), p. 2. Recs of Baltimore Engr Dist, Washington Nat Rec Ctr, Suitland, Md. Rec Gp 77, ACC 72A2510, box 88. (2) Elsie Singmaster, *Pennsylvania's Susquehanna* (Harrisburg: J. H. McFarland Co., 1950), p. 43. (3) Burggraf and King, *Susquehanna River Basin*, p. 34. (4) Raymond E. Myers, *The Long Crooked River* (Boston: Christopher Publishing House, 1949), p. 231.

[4]For a description of the anthracite combination, see (1) Jules Bogen, *The Anthracite Railroads* (New York: Ronald Press Co., 1927). (2) Eliot Jones, *The Anthracite Coal Combination in the United States* (Cambridge, Mass: Harvard University Press, 1914). (3) Scott Nearing, *Anthracite: An Instance of Natural Resource Monopoly* (Philadelphia: John C. Winston & Co., 1915).

[5]Telg, Sec War William Howard Taft to A. J. Cassatt, Pres, Pennsylvania RR, 8 Mar 1904. William Howard Taft Papers, Library of Congress, MS Div, series 8, reel 482.

[6]Reprint of speech by Rep J. Hampton Moore of Pa, (Washington: GPO, 26 Feb 1914), p. 15.

[7]Ltr, Brig Gen W. P. Leber, Dir of Civil Works, to Rep John G. Dow of New York, 25 Aug 1966. Recs of Baltimore Engr Dist; Mailing and Recs Br, box 129. (2) U.S. Congress, H. R. Comm on Flood Control. Hearings on Flood Conditions in Susquehanna River, 3 Feb 1917, pp. 22-24.

[8](1) *Ibid.*, p. 8. (2) CE, Survey of the North Branch of the Susquehanna River, Pennsylvania and New York. 69th Cong., 2d sess., H. Doc. 647, 27 Jan 1927, p. 7.

[9]*Ibid.*, p. 21

[10]TLO, "Historical Summary of the Baltimore District Office" (Jan 1944), p. 12. Recs of Baltimore Engr Dist; Hist Install File.

[11]Ltr, VP, Scranton Chamber of Commerce, to Sec War George H. Dern, 1 Jun 1933. Rec Gp 77, ACC 71A939, box 50.

[12]Col Elliot J. Dent, Concise Rpt on Development of Susquehanna River, 9 March 1934. Rec Gp 77, ACC 71A939, box 50.

[13](1) TLO, "Historical Summary of the Baltimore District Office," p. 13 Recs of Baltimore Engr Dist; Hist Install Files. (2) Dent, Report on Flood Losses, Susquehanna River Basin, New York State, 23 Jul 1935. Rec Gp 77, ACC 71A939, box 50.

[14]Harrisburg *Patriot*, 13 Mar 1936, pp. 1, 14.

[15]Philadelphia *Inquirer*, 14 Mar 1936, pp. 1, 26.

[16]*Ibid.*, 16 Mar 1936, p. 4.

[17]*Ibid.*, 19 Mar 1936, p. 1.

[18]Harrisburg *Patriot*, 19 Mar 1936, pp. 3, 26.

[19]*Congressional Record*, 74th Cong, 2d sess., 31 Mar 1936. Reprint of editorial from *Pittsburgh Press*, (submitted by Sen Joseph F. Guffey of Pa), 29 Mar 1936, p. 4648.

[20]*Ibid.*, 74th Cong., 1st sess., 22 and 23 Aug 1935, pp. 14303 and 14304.

[21]*Ibid.*, 74th Cong., 2d sess., 23 Mar 1936, p. 4149.

[22]*Ibid.*, reprint of article by Sen Robert F. Wagner of New York in *New York Times*, 22 Mar 1936, pp. 4197-98.

[23]*Ibid.*, 16 Apr 1936, p. 5572.

[24]*Ibid.*, 23 Mar 1926, p. 4191.

[25]*Ibid.*, p. 4195.

[26]*Ibid.*, 7 May 1936, p. 6792.

[27]*Ibid.*, 21 May 1936, p. 7710; 2 Jun 1936, p. 8642; 3 Jun 1936, pp. 8862-63.

[28](1) TLO, "Historical Summary of Baltimore Dist. Off," p. 13. Recs of Baltimore Engr Dist; Hist Install Files. (2) Joseph E. Book, Ch, Flood Plain Management Serv, Baltimore Engr Dist, "History of Southern New York Flood Control Projects" (1954), pp. 3-5.

[29]Rpt, Col William A. Johnson, Dist Engr, 2 May 1938. Rec Gp 77, ACC 71A939, box 52.

[30]N Atlantic Engr Div, "Water Resources Development in Pennsylvania (1973), pp. 40-41.

[31]GAO, *Local Participation in Flood Control and Navigation Projects, Corps of Engineers* (Washington, 1957), p. 23.

[32](1) N Atlantic Engr Div, "Water Resources Development in Pennsylvania" pp. 40-41. (2) Interv, Kanarek with C. F. Pfrommer, former Baltimore Engr Dist employee, 31 Mar 1976, pp. 8-12.

[33]Interv, Kanarek with F. R. Deland, former Baltimore Engr Dist employee, 30 Apr 1976, pp. 58-59.

[34]U.S. Congress, H.R. Comm on Flood Control, *Susquehanna River Pennsylvania West Branch*. 74th Cong, 1st sess., 1 May 1935, p. 8. The Board of Engineers report of 18 Feb 1930 (p. 2), on the West Branch, reprinted by the House Committee on Flood Control, noted the stream to be "badly polluted from its source to Lock Haven, a distance of more than 100 miles. This pollution is caused chiefly by the drainage from coal mines located in the adjacent area. The stream is devoid of fish life and there is no vegetation in the stream bed."

[35]Rpt on Williamsport Local Protection Project, Jan. 1955. Rec Gp 77, ACC 72A2510, box 91.

[36](1) Report on Hydrology for the Indian Rock Dam, 26 Nov 1938. Rec Gp 77, ACC 71A939, box 55. (2) Condition of Improvement, York, Pa., 30 Jun 1961. Recs of Baltimore Engr Dist; PAO, box 2.

[37]Ltr, C. L. Schletzer, Actg Ch, Engineering Div, to R. E. Brunswick Sharp of York, Pa., 3 Aug 1972. Recs of Baltimore Engr Dist; PAO, box 2.

[38]Rpt on Indian Rock Reservoir, Apr 1959. Rec Gp 77, ACC 72A2510, box 92.

[39]Annual Rpt, CofEngrs, 31 Oct 1945, p. 485.

[40](1) *Ibid.*, 25 Apr 1952, pp. 376-77. (2) Col. Louis W. Prentiss, Jr., who was Baltimore District Engineer from June 1971 to July 1973, commented on the sharp divisions within the Sunbury community over the flood walls. He observed, however, that after Hurricane Agnes in June 1972, he could not find a soul in the town who did not praise the flood-protection structures there. Interv with

Kanarek, 9 Aug 1974. (3) See also CE, Susquehanna River at Sunbury, Pa., 76th Cong., 1st sess., H. Doc. 366, 22 Jun 1939.

[41]Annual Rpts, CofEngrs, 10 Dec 1954, p. 235; 1955, vol. II, p. 220; 1956, vol. II, p. 308; 1957, vol. II, p. 308.

[42]Interv, Kanarek with James P. Weaver, former Baltimore Engr Dist employee, 27 May 1976.

[43]In 1967, the Alvin R. Bush Dam won the Army Chief of Engineers First Annual Award for Conservation of Natural Beauty in the construction of water resources facilities. Conservation Capsules, n.d. Recs of Baltimore Engr Dist; PAO, box 1.

[44](1) PAO, Baltimore Engr Dist, "Alvin R. Bush Dam" (1970). Recs of Baltimore Engr Dist; PAO, box 1. (2) Rpt on Alvin R. Bush Dam, Jul 1963. Rec Gp 77, ACC 72A2510, box 89.

[45](1) Interv, Kanarek with Weaver, 27 May 1976, pp. 20–24. (2) Interv, Kanarek with Deland, 30 Apr 1976, pp. 22–23.

[46]Remarks by Col. Warren R. Johnson at ceremony for Alvin R. Bush Dam, 8 Aug 1962. Recs of Baltimore Engr Dist; PAO, box 1.

[47]Speech material on Bush Dam, prepared by Engineering Div, 6 Sep 1973. Recs of Baltimore Engr Dist; PAO, box 1.

[48]PAO, Baltimore Engr Dist, "Curwensville Dam" (Feb 1970). Recs of Baltimore Engr Dist; PAO, box 1. (2) Report of Dept of Interior, Fish and Wildlife Serv, on Curwensville Reservoir, 26 Jan 1960. Rec Gp 77, ACC 72A2510, box 88.

[49](1) Interv, Kanarek with Weaver, 27 May 1976, pp. 28–33. (2) Interv, Kanarek with John Hunter, Asst Area Engr, Harrisburg Area Office, 25 May 1976, pp. 4–6. (3) Interv, Kanarek with Michael Kolessar, Ch, Proj Planning Br, Apr 1976, p. 5.

[50](1) Press release, Baltimore Engr Dist, 27 May 1965. Recs of Baltimore Engr Dist; PAO, box 2. (2) Quarterly Ltr. Love, to Duke, 31 Jul 1969. Recs of Baltimore Engr Dist; Hist Instal File.

[51]Ltr, N Atlantic Div Engr to CofEngrs, 22 Apr 1966. Recs of Baltimore Engr Dist; Mailing and Recs Br, box 129.

[52]Interv, Kanarek with Paul J. Jones, former Baltimore Engr Dist employee, Apr 1976, p. 21.

[53]Ltr, Col R. P. Kline, Dep Div Engr, to Rep John Taber of NY, 20 Jun 1960. Rec Gp 77, ACC 72A2510, box 88.

[54]Interv, Kanarek with Jones, Apr 1976, p. 2.

[55](1) Interv, Kanarek with Deland, 30 Apr 1976, pp. 8–11. (2) N Atlantic Engr Div, "Water Resources Development In New York" (1973), pp. 95–96.

[56]Annual Rpts, CofEngrs, 1947, pp. 466–73; 1968, vol. II, pp. 231–33.

[57](1) Baltimore Engr Dist, Activities in New York, 1 Jul 1963 to 30 Jun 1964, pp. 2–3. Recs of Baltimore Engr Dist; Hist Instal File. (2) Ltr, R. H. Resta, Ch, Engineering Div, to Roger M. Latham, outdoor editor, *Pittsburgh Press*, 14 Jul 1971. Recs of Baltimore Engr Dist; PAO, box 4.

[58]Annual Rpt, Cof Engrs, 1961, vol. II, p. 305. The 1954 Flood Control Act passed in the House of Representatives by a voice vote on 26 July and in the Senate by a vote of 77 to 2 on 2 Aug. *Cong Rec*, 83rd Cong., 2d sess., pp. 12048–12084 and 14750–14769.

[59]*Ibid.*, 85th Cong., 2d sess., pp. 5943, 6062, 6389 and 6391.

[60](1) Annual Rpts, Cof Engrs, 1961, vol. II, pp. 306–308; 1963, vol. II, p. 316; 1964, vol. II, p. 283; 1965, vol. II, p. 272; 1966, vol. II, p. 311; 1967, vol. II, p. 24. (2) Quarterly Ltrs, Love to Duke, 30 Jul 1970 and 30 Apr 1971. Recs of Baltimore Engr Dist; Hist Instal File.

[61]Interv, Kanarek with Weaver, 27 May 1976, pp. 16–17.

[62]Rpt on Stillwater Reservoir Proj, Jan 1956. Rec Gp 77, ACC 72A2510, box 90. (2) PAO, Baltimore Engr Dist, "Stillwater Dam," n.d.; Recs of Baltimore Engr Dist; PAO, box 5.

[63]Annual Rpts, CofEngrs, 1963, vol. II, pp. 321–22; 1967, vol. II, p. 280; 1968, vol. II, p. 203; 1969, vol. II, p. 183; 1970, vol. II, p. 169; 1971, vol. II, pp. 18–19.

[64]Interv, Kanarek with John T. Starr, former Baltimore Engr Dist employee, Apr 1976, pp. 59–60.

[65](1) Annual Rpts, CofEngrs, 1963, vol. II, pp. 320–21; 1969, vol. II, p. 183. (2) Quarterly Ltr, Col Frank W. Rhea, Baltimore Dist Engr, to N Atlantic Div Engr, 30 Jan 1968. Recs of Baltimore Engr Dist; Hist Instal File.

[66]Interv, Kanarek with Prentiss, 9 Aug 1974.

[67]See Baltimore *News-American*, 2 Aug 1970, sec. F, pp. F1 and F6.

[68]Susquehanna River Basin Study Coordinating Committee, *Susquehanna River Basin Study, Summary* (Jun 1970), p. 129.

[69](1) Rpt on Flood Protection, Forest Heights, Md, Apr 1961. Rec Gp 77, ACC 72A2510, box 89. (2) Annual Rpt, CofEngrs, 1964, vol. II, p. 277.

[70](1) Rpt on Local Flood Protection Proj, Kitzmiller, Md, Jan 1961. Rec Gp 77, ACC 72A2510, box 90. (2) Annual Rpt, CofEngrs, 1964, vol. II, p. 277.

[71]Ltr, Col Roy S. Kelley, Baltimore Dist Engr, to Rep Charles McC. Mathias, Jr., of Md, 15 Jan 1963. Rec Gp 77, ACC 68A2565, box 123. (2) Annual Rpt, CofEngrs, 1972, vol. II, pp. 4–17.

[72](1) Proj Rpt, Bayard, W Va, Mar 1961. Rec Gp 77, ACC 72A2510, box 89. (2) Annual Rpts, CofEngrs, 1964, vol. II, p. 271; 1965, vol. II, p. 261.

[73]Ltr, Kelley to Mathias, 17 Sep 1964. Rec Gp 77, ACC 68A2565, box 124. (2) Quarterly ltr, Rhea to N Atlantic Div Engr, 30 Jan 1968. Recs of Baltimore Engr Dist; Hist Instal File. (3) Annual Rpt, CofEngrs, 1972, vol. II, pp. 4–16.

[74]*Ibid.*, pp. 4–15 and 4–16.

[75]Rpt on West Branch of Patuxent River, Upper Marlboro, Md, Jun 1960. Rec Gp 77, ACC 72A2510, box 91.

[76](1) Annual Rpt, CofEngrs, 1972, vol. II, pp. 4–17. (2) During an interview Baltimore District Engineer Col. Louis W. Prentiss, Jr. observed that politically the Four Mile Run project "caused me as much expenditure of my energy with the Congress and with my boss and direct involvement as anything I've done." Interv, Kanarek with Prentiss, 4 Aug 1974.

Chapter X

A Diverse Force in Civil Works: The Modern Baltimore Engineer District

While the Flood Control Act of 1936 thrust the Corps of Engineers into the forefront of national flood-protection operations, the Corps continued to supervise navigation dredging on the nation's waterways. Streams in Maryland particularly on its Eastern Shore, again dominated the Baltimore District's attention, along with Baltimore harbor, several waterways in Virginia and, beginning in 1961, the Washington, D.C. Harbor.

New navigation projects on Maryland's Eastern Shore were numerous, although the Corps rejected many proposals as being economically unjustified. Still, dredges worked in many of the Eastern Shore's streams which had been untouched before the mid-1930's. For example, in 1935 Congress approved dredging operations for Dorchester County, providing for a seven-foot-deep channel through Tar Bay and Fishing Creek to the Honga River. Dredging progressed swiftly, contractors achieving the dimensions between August and November 1935 at a saving of about $12,000 less than the estimated cost of $40,000.[1]

At Ocean City, Maryland, work began in 1933 with a combination of regular War Department funds and emergency relief money allotted by the Public Works Administration and the Works Progress Administration. By 1936 the Corps had constructed an inlet ten feet deep, protected by stone jetties, between the Atlantic Ocean and Sinepuxent Bay. Since then the jetties have been repaired and in 1956 workers raised the north jetty from seven to nine feet.[2]

At the head of Tangier Sound, in Fishing Bay, a wide shallow estuary surrounded by low marshland, contractors in 1937 began dredging to provide access to county and packing-house wharves in Tedious, Goose, Farm and McReadys Creeks.[3] Between 28 February and 14 March 1972, contractors dredging at Goose Creek itself completed digging a basin 120 feet wide and 170 feet long.[4]

Other minor projects on the Eastern Shore begun by the District since 1933 include channel excavation at Northeast River, Island Creek, Herring Bay, Rockhold Creek, Knapps Narrows, Town Creek, Black Walnut Harbor, Duck Point Cove, Lowes Wharf, Little Creek, St. Michaels harbor, Neal Sound, Muddy Hook and Tyler Coves, Shad Landing, Neavitt Harbor and Websters Cove. Some of these operations, such as the one at Knapps Narrows, were done with funds from Depression Period relief agencies, especially the Public Works Administration.

After rejecting improvement of Black Walnut harbor off the Choptank River in 1937, for social reasons the Board of Engineers for Rivers and Harbors and the Chief of Engineers reversed themselves two years later. The report of the Board of Engineers of February 1939 observed that without a dependable harbor local watermen were constantly on the verge of economic

disaster. "The seafood industry," the Board concluded, "provides at best a bare livelihood for a considerable number of citizens. Improvement of a harbor at a relatively small cost to the United States may well permit a community to continue to be self-supporting when otherwise it may become a public charge."[5]

On the western side of Chesapeake Bay in Maryland, the Baltimore Engineer District supervised navigation enterprises at places such as Parish, Back, Fishing, St. Jerome, Cypress and Cuckold Creeks, Nan Cove, Herring Bay and Catherines Sound. In May 1936 dredging began at Parish Creek, a small branch of the West River about seven miles south of the Severn River near Annapolis. By August a waterway eight feet deep and fifty feet wide from the deep water in the West River to Parish Creek had been completed with funds from the Works Progress Administration.[6]

The improvement at Back Creek, a small tidal inlet just below Annapolis harbor in Anne Arundel County, required constructing a jetty seventy feet long to prevent shoaling caused by drift and to provide additional mooring space for small leisure and fishing craft. At Herring Bay, a wide-mouthed indentation on the west side of Chesapeake Bay about twenty miles below Annapolis, contractors dredged a turning basin and built a stone breakwater 900 feet long. In May 1941 the Baltimore office let contracts for constructing twin jetties at Fishing Creek's entrance to Chesapeake Bay, fifty-six miles below Baltimore, to provide a small-boat harbor on an exposed area of the bay. Workers completed the jetties during the next year. The operation at Cypress Creek, an inlet of the Magothy River north of Annapolis, entailed dredging a channel seven feet deep and seventy five feet wide through an entrance bar.[7] At St. Jeromes Creek, a tidal estuary in St. Marys County that enters the Western Shore of Chesapeake Bay six miles north of Point Lookout at the mouth of the Potomac River, the District managed the dredging of a 4,900-foot-long channel to a depth of seven feet. At Catherines Sound, a tidal estuary of the Potomac River also in St. Marys County, the federal project, finished in 1957, produced a six-foot depth in the strait.[8] During the 1960's the District constructed a small-boat harbor at Nan Cove on the left bank of the Patuxent River about sixty miles south of Baltimore. It also dredged a six-foot-deep channel in Cuckold Creek, a tidal estuary

Drift collection at Tidal Basin, Washington D.C.

on the left bank of the Potomac River forty miles upstream from the mouth of that river at Chesapeake Bay.[9]

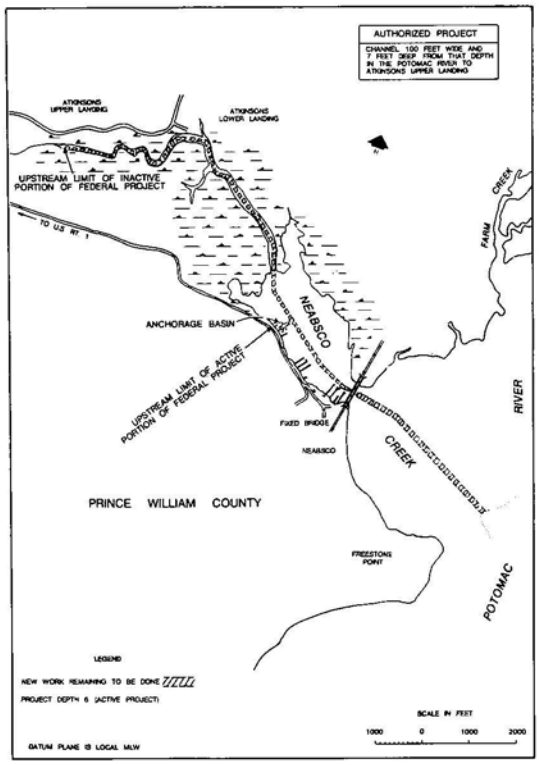
The Baltimore District's navigation operations in Virginia expanded when it absorbed the Washington District in June 1961. Before that, the Baltimore office had been in charge of some streams in Virginia's upper Chesapeake Bay region such as Starlings Creek, Onancock River and Tangier Channel. In 1937, the District oversaw dredging in Chincoteague Bay, digging an **L**-shaped harbor five feet deep, sixty feet wide and 1,500 feet long. In addition, the District dredged a tidal waterway on the coast of Virginia, including a series of inland thoroughfares in the northeastern part of Accomac County on the Eastern Shore, extending from Chincoteague Inlet on the north to Assawoman Inlet on the south.[10]

More recent missions in Virginia include constructing jetties to open the entrance from Bonum Creek into the Potomac River eighteen miles upstream from Chesapeake Bay; dredging in Deep Creek, a small stream about seven miles long on the western side of the Delmarva Peninsula about fifty miles north of Cape Charles; and reactivating an 1881 project in Neabsco Creek to a six-foot-deep channel in the estuary which enters the west side of the Potomac River about eighty-three miles above its mouth and about twenty-seven miles south of Washington, D.C. Maintenance dredging in Monroe Bay and Creek, a slight indentation on the right bank of the Potomac River in Westmoreland County thirty-four miles upstream from Chesapeake Bay, in 1965 and 1971 restored 1931 project dimensions to establish a channel through the bar at the entrance and a turning and anchorage basin in the creek. Monroe Creek has become a valuable base of operations for a large oyster fleet, and recreational craft based at Colonial Beach ply the waterway extensively during the summer.[11]

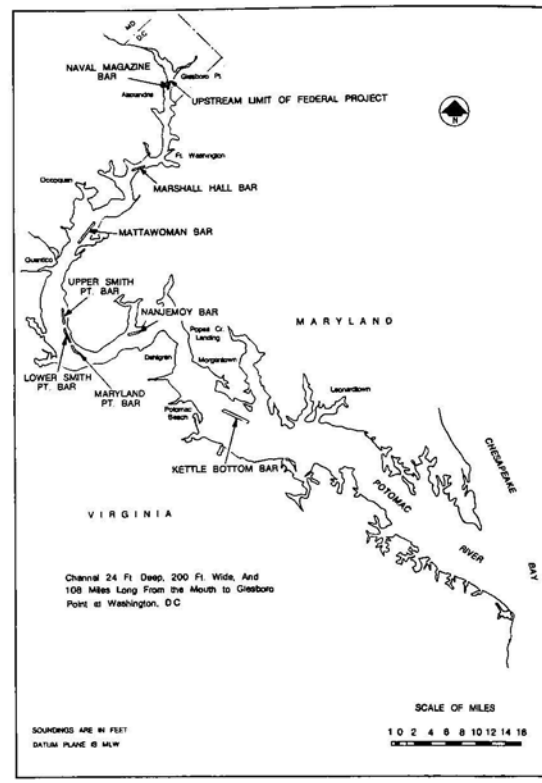
In June 1961 the Baltimore District became responsible for the Washington harbor and the Potomac River at and below the nation's capital. The Washington harbor comprises three sections: the Washington Channel at Hains Point; the Virginia Channel from Giesboro Point to Francis Scott Key Bridge; and the Anacostia River from Giesboro Point to the Eleventh Street Bridge. The Corps is in charge of new work and maintenance dredging in these channels and operating the gates at the Tidal Basin by hired labor.[12]

Below Washington, the Baltimore District maintains in the Potomac River a 108-mile navigation channel twenty four feet deep and

Water chestnut plants must be removed from the Potomac River annually in order to keep navigation open. U.S. Army Corps of Engineers.—National Archives



Neabsco Creek, Virginia



Potomac River below Washington, D.C.

200 feet wide. This required collecting and removing drift from the water and uprooting water chestnuts that infested navigable portions of the Potomac River and its tributaries between Key Bridge and Maryland Point, forty-eight miles downstream from Washington. At the height of infestation in 1939, the water chestnut covered about 10,000 acres of navigable waters in the Potomac and had to be removed annually. "Should any abatement of the present removal operations be effected," the Chief of Engineers noted in 1972, "the plant would quickly be reestablished and thus nullify all previous work and expenditures."[13]

II

The main civil-works project of the Baltimore District before extensive dam construction in 1936 continued to be improving Baltimore harbor. The city and the federal government spent millions of dollars on new work and maintenance dredging. Up to 1945, the federal government alone removed more than 111 million cubic yards of material from Baltimore harbor at a cost of nearly $17 million.[14]

At the beginning of the twentieth century the port of Baltimore was one of the most crowded on the Atlantic seaboard. A large variety of craft jammed its piers, from oyster boats to huge cargo ships. The approach channels that led to the inner harbor were thirty feet deep in some places and as wide as 600 feet. Dredges continued to labor in the Patapsco's waters to preserve the channel, striving toward a width of 600 feet throughout. But even as the dredges lifted mud from the river's bottom, the ambitions of Baltimore's city fathers for an even larger harbor brought pressure to bear forCongress to authorize a new harbor project to benefit the city.

For Baltimoreans, as well as for most Americans, 1900 was a time for optimism when the limitless resources of the world seemed to be within the nation's reach. Spain had been defeated so easily that many Americans thought there was no end to the

influence of their power. At the same time, there appeared to be no threat on the horizon that would challenge this "best of all possible worlds." Dreams of a world wide commercial empire might now be realized. Of course, Baltimoreans wanted to share in this prosperity and keep their city near the top of the major trade centers on the Atlantic coast. That a bigger harbor was necessary became a foregone conclusion.

The Baltimore Chamber of Commerce, the Board of Trade and the Merchants and Manufacturers Association were exceedingly anxious to have the main channel deepened to 35 feet and widened to 1,000 feet from Baltimore to the sea. In January 1901 the Baltimore District Engineer, Lt. Col. Oswald H. Ernst, who had served in Puerto Rico during the Spanish-American War, urged the adoption of such a project. The growth of international trade, he observed in a letter to his superiors in Washington, had been marked by an enlargement in the size of seagoing vesssels. "Channels well adapted to the trade of a few years ago are no longer sufficient," he concluded. "Projects soon become obsolete. This is beginning to make itself felt in the harbor of Baltimore."[15]

Ernst's successor, Col. Peter C. Hains, who had supervised the building of defenses for Baltimore harbor between 1896 and 1896, also supported expansion of the main channel. However, Hains advised the city's business community to drop the idea of a channel 1,000 feet wide and to confine themselves to gaining of a depth of thirty five feet within the current 600-foot width. Hains warned business groups in the city "that if they were to try to get an appropriation of an amount sufficient to make a 1,000 ft. channel the probability was they would not get anything." Hains' advice was heeded.[16]

A fire that ravaged the downtown business district on 7 February 1904 only temporarily slowed the campaign for deeper harbor channels.[17] Commercial interests persistently reminded government officials that some vessels trading in the port could not load their ships to draft limits and navigate the existing channel to the sea. Other large cargo carriers, they complained, avoided the port because they would have to sacrifice too much of their payload to make entrance profitable. Finally, the drive for harbor enlargement paid off when, on 3 March 1905, Congress authorized dredging the approach channels to the city to a depth of thirty-five feet. It appropriated $250,000 for that year and approved an additional $1 million for work under continuing contracts. Before 1902, Congress had ratified minor dredging projects in Curtis Bay and the southwest Baltimore harbor at Spring Garden. Before that year only city-authorized dredges had excavated in Spring Garden.[18]

Digging the thirty-five-foot channel was finished in 1915 at a cost of almost $4 million. Unfortunately, cargo carriers of larger drafts still could not use the port's facilities because neither the city nor private terminal owners had provided a depth of thirty-five feet at any of the wharves or docks in the inner harbor. During 1916, however, dredging contractors working for Baltimore dug the inner harbor to a depth of thirty-five feet to conform to the deepening underwritten by Congress.[19]

Throughout this period the dumping of spoil caused controversy. Most of the excavated mud was deposited in Chesapeake Bay. However, the potential damage to the bay's oyster industry caused growing concern. In 1902 Colonel Hains warned of the need for disposing of spoil other than by carrying it farther out into the bay and dumping it in deep water. He worried that this spoil would sweep over the oyster beds and destroy them. "The oyster business is an important one to Baltimore and anything tending to destroy any part of it," he cautioned, "will be violently opposed." As an alternative, he proposed that the United States use the dredged waste to construct an artificial island in the channel.[20] Although no one took up his idea, for the first time many began to realize the problem, and the fishing industry continued to protest the indiscriminate disposal of spoil in Chesapeake Bay. For example, in 1906, oyster packers complained bitterly about dredged mud on the natural oyster rock on the roads of Man-of-War shoals, then the most prolific beds in the bay. These firms estimated that between 1904 and 1906 about 1,000 acres of oyster beds had been destroyed by this dumping.[21]

Finally, in 1917 Congress required that all new work in Baltimore harbor be conditioned upon the local community providing areas behind bulkheads for depositing dredged material. The city met the condition by building a bulkhead at McComas Street. The River and Harbor Act of 1930 that authorized expanded anchorage facilities also required

the city to supply suitable disposal areas alongside bulkheads behind which local interests would agree to pump the spoil. Again the city complied with the terms for local cooperation.[22]

During the years between both World Wars the federal government continued to contract dredges to widen and deepen the harbor. At the same time, the state of Maryland authorized the city of Baltimore to incur all indebtedness of $50 million for expanding port facilities.[23] During 1932 the Port Development Commission completed the construction of an $8.5 million terminal pier under an agreement with the Western Maryland Railway while the army spent $1 million on new work and maintenance dredging.[24]

By 1936 the main channel was thirty-seven feet deep in some places. Although local shippers still sought to have the channel widened from 600 feet to reduce accidents, the Baltimore District Engineer, Col. Elliot J. Dent, writing in 1933, did not consider a wider channel mandatory. Most accidents, Dent wrote, were caused by carelessness. Certainly the 600-foot channel did not inhibit the flow of commerce. Steamship service at Baltimore extended to all major foreign countries and to all the principal domestic ports.[25] Shipping that passed along the shores of the Patapsco River to and from Baltimore had more than doubled; from 8,894,570 tons in calendar year 1900 to 21,887,711 tons in 1936.[26]

A major contribution to the expanded commerce of Baltimore's port was the federal government's decision to finally build the Chesapeake and Delaware Ship Canal which would bring Philadelphia and Baltimore closer to the Atlantic Ocean. Since 1871 Congress had been debating the feasibility of constructing this canal. Disputes over routes and the economic advisability of the scheme plagued

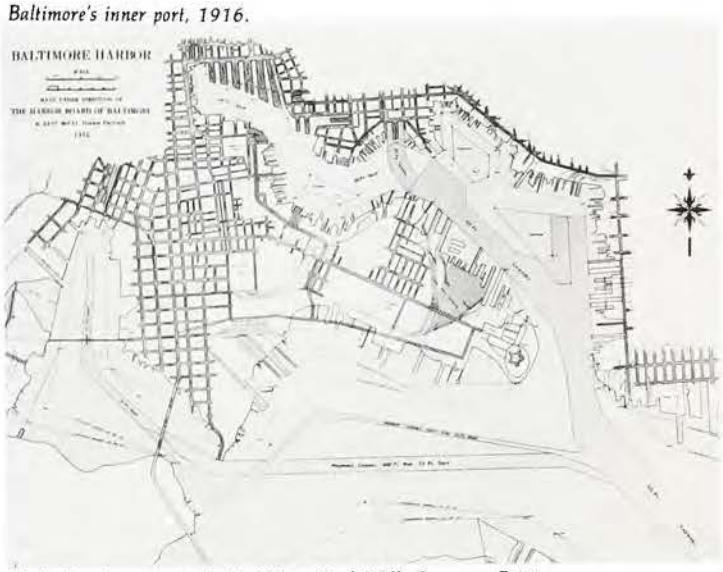
Map of Baltimore's inner port, 1902.—Library of Congress

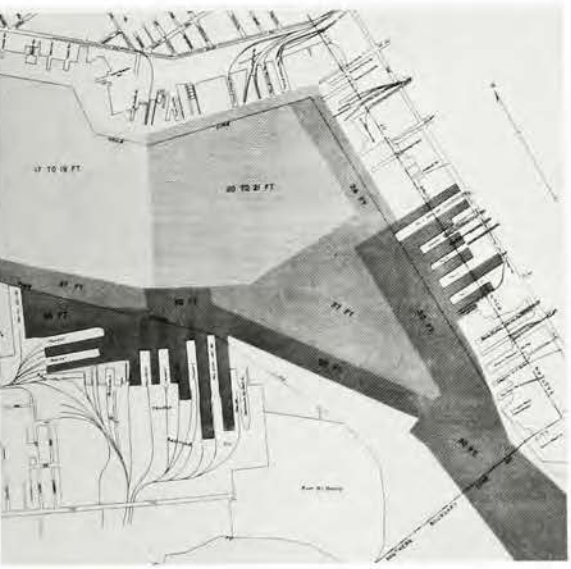
View of Baltimore Harbor from Federal Hill in 1903.—Library of Congress

promoters. A Presidential commission, appointed in 1906 to study the best course for a waterway to connect Chesapeake and Delaware Bays, recommended purchasing and improving the old canal originally built between 1824 and 1829. But not until 1919 would the government finally acquire the property.[27]

Between 1922 and 1929 the Wilmington District Engineer supervised building a lock-free canal twelve feet deep and ninety feet

Baltimore's inner port, 1916.





Unloading iron ore at the Bethlehem Steel Mill, Sparrows Point, September 1940.—Farm Security Administration, Library of Congress

wide. This required deep excavation and constructing new bridges to span the improved waterway. Eventually, in 1935 Congress adopted a new enlargement plan for the canal that provided a depth of twenty seven feet and a width of 250 feet from the Delaware River to the Elk River and 400 feet in the Elk River and Chesapeake Bay. The blueprint added about twenty-six miles in approach channels to the length of the project.[28] The War Department left the expansion of the canal itself to the Philadelphia Engineer District while it assigned the Baltimore District the task of excavating the twenty-six miles of approach channels down Elk River and Chesapeake Bay from the mouth of Back Creek.

The United States hopper dredge *Navesink* began excavating the approaches on 21 July 1936. In September, United States hopper dredges *Absecon, Atlantic* and *Delaware* joined the force. By May 1938 the four dredges had removed more than 24 million cubic yards of material from the waterway.[29]

The Baltimore Harbor Industrial Piers, June 1938.—Farm Security Administration, Library of Congress

Baltimore Waterfront, June 1938.—Farm Security Administration, Library of Congress

The canal's conversion from barge to ship waterway brought a substantial growth in the volume of commerce that traveled the Patapsco River to Baltimore. During March 1938, thirty-two coastwise and overseas ships moved to and from Baltimore through the partially completed ship canal. By 1960, 20,000 vessels passed through the canal each year. The Philadelphia Engineer District enlarged the canal during the 1960's and supervises the operation of this artificial water highway.[30]

III

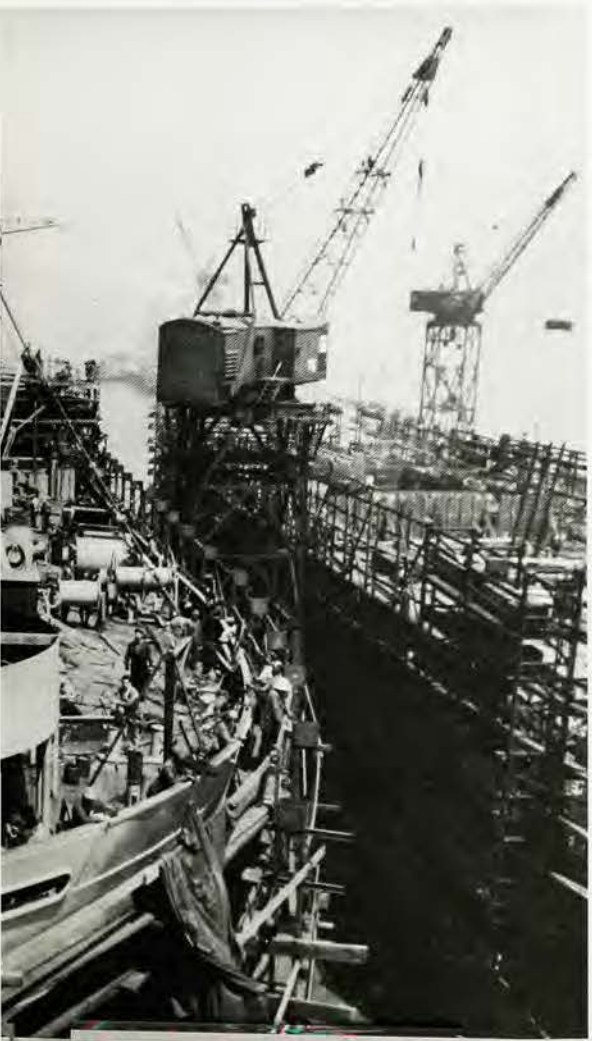
By the 1930's the prevailing depth in Baltimore harbor was thirty-five feet. Operations consisted primarily of maintenance dredging by U.S. hopper dredges *Navesink* and *Manhattan* and contract dredging in Curtis Creek. During World War II extensive new work became a luxury the nation could ill afford. Though in June 1942 the Chief of Engineers, Maj. Gen. Eugene Reybold, rec-

Bethlehem-Fairfield Shipyards, May 1943.—U.S. Office of War Information, Library of Congress.

ommended an appropriation for improving the channel depth to thirty-nine feet, Secretary of War Henry L. Stimson rejected any such request for funds. Because of "the absence of evidence showing that the proposed works are necessary to the prosecution of the war," he observed, "the submission during the present emergency of an estimate of appropriation for construction of the project[Baltimore harbor] would not be in accord with the program of the President."[31] However, maintenance dredging continued to keep war materiel, particularly iron ore and petroleum products, moving in and out of the harbor. The Baltimore District Engineer, Lt. Col. Oscar J. Pool, viewed such maintenance operations as essential to the war effort. The shortages of iron and oil "make it imperative," Pool warned, "that their shipment be expedited and not be delayed by boats grounded in a channel."[32]

After World War II Congress did revise the Baltimore harbor project by providing for a channel depth of thirty-nine feet throughout. Also, new work by contract dredging in 1946 and 1947 created a connecting channel twenty seven feet deep and 400 feet wide between Baltimore and the Chesapeake and Delaware Canal. The River and Harbor Act of 30 June 1948 authorized collecting and removing drift from Baltimore harbor as a separate project with money coming from general maintenance funds for existing river and harbor works.

New excavations and maintenance dredging continued simultaneously until 1954 when the thirty-nine-foot depth was achieved at a cost of about $15 million.[33] Meanwhile, the Corps of Engineers was already recommending further deepening of the harbor to forty-two feet and widening it to 800 feet, with 1,000 feet in the angles. The harbor had not been greatly widened since the nineteenth century. Congress adopted the Corps proposal in 1956, but it fell to a Presidential veto in an Administration effort to cut the public-works budget. A second veto the next year was another setback for the



Bethlehem-Fairfield Shipyards, May 1943.—U.S. Office of War Information, Library of Congress

The Wicomico Patrol Ship.

promoters of harbor expansion. Finally, the project became law in 1958, and in 1960 Congress appropriated $1.9 million to start excavating.

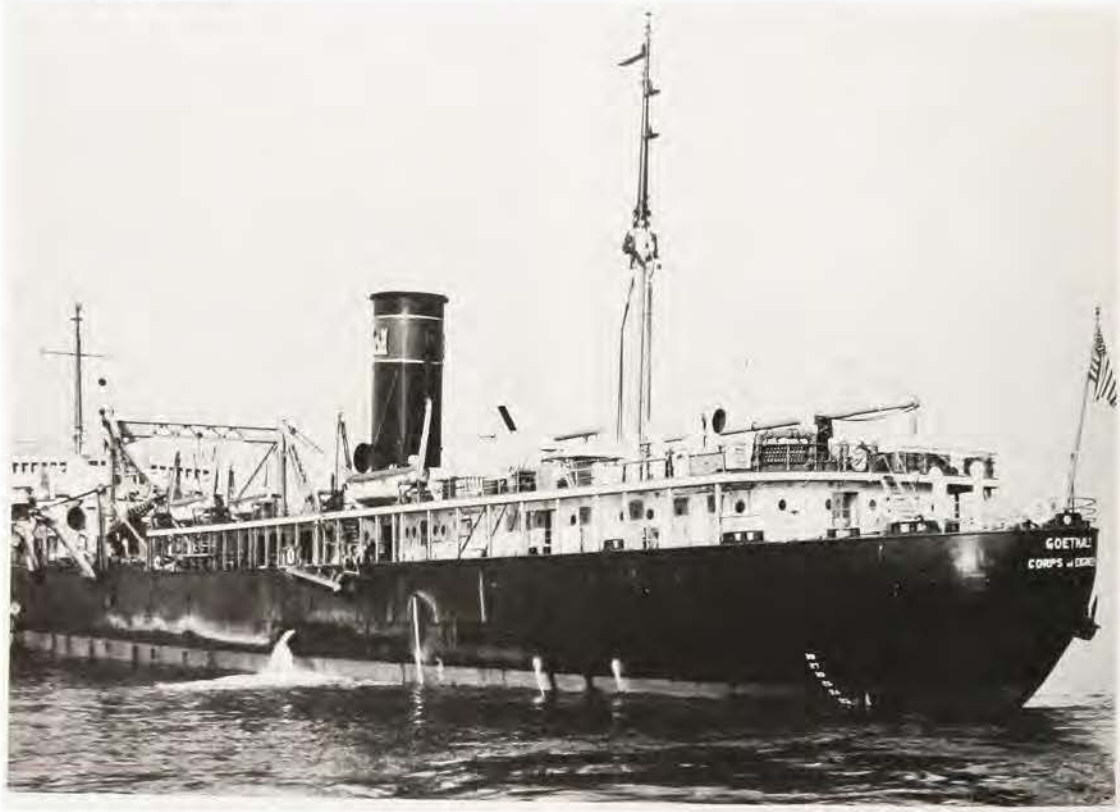
During the 1960's, either the U.S. dredge *Essayons* or the *Goethals* was seen frequently in the Patapsco River. Not only did they perform maintenance and new-work tasks; they dredged the connecting waterway to the Chesapeake and Delaware Canal to a width of 450 feet.[34]

As soon as one project was completed it became time to plan for the next. The River and Harbor Act of 31 December 1970 authorized a federal project to deepen the Baltimore harbor channels from forty two to fifty feet.[35] However, a dispute over the proper disposal area for spoil delayed digging until February 1975. Further harbor expansion is hotly contested in the Baltimore area and its surroundings. Certainly the federal enlargements of the Baltimore harbor channels by the Baltimore Engineer District, combined with efforts by the city and state, have made Baltimore one of the leading commercial ports in the world. The port has forty five miles of waterfront of which about twenty five miles are industrially developed. The issue of how much further growth will eventually become counterproductive in terms of effect on both commerce and ecology has not yet been answered. Only during the last few years has a finite limit on expansion even been contemplated.

IV

Part of the comprehensive duties of the Corps of Engineers in controlling water resources is the prevention of pollution. The Refuse Act of 1899 prohibited dumping of any materials into navigable waters without a permit, but for years the law was only occasionally enforced to protect navigation. Beginning the 1960, the Supreme Court of the United States broadened its interpretation of that act, and by 1970 the Corps was

U.S. Dredge GOETHALS.



enforcing the permit requirements of the law for all discharges into water highways. Since the passage of the National Environmental Policy Act of 1969 and the Water Pollution Control Act of 1972, the Corps has attempted to regulate discharges in streams that have no effect on navigation but which threaten a particular area's ecology. For example, as

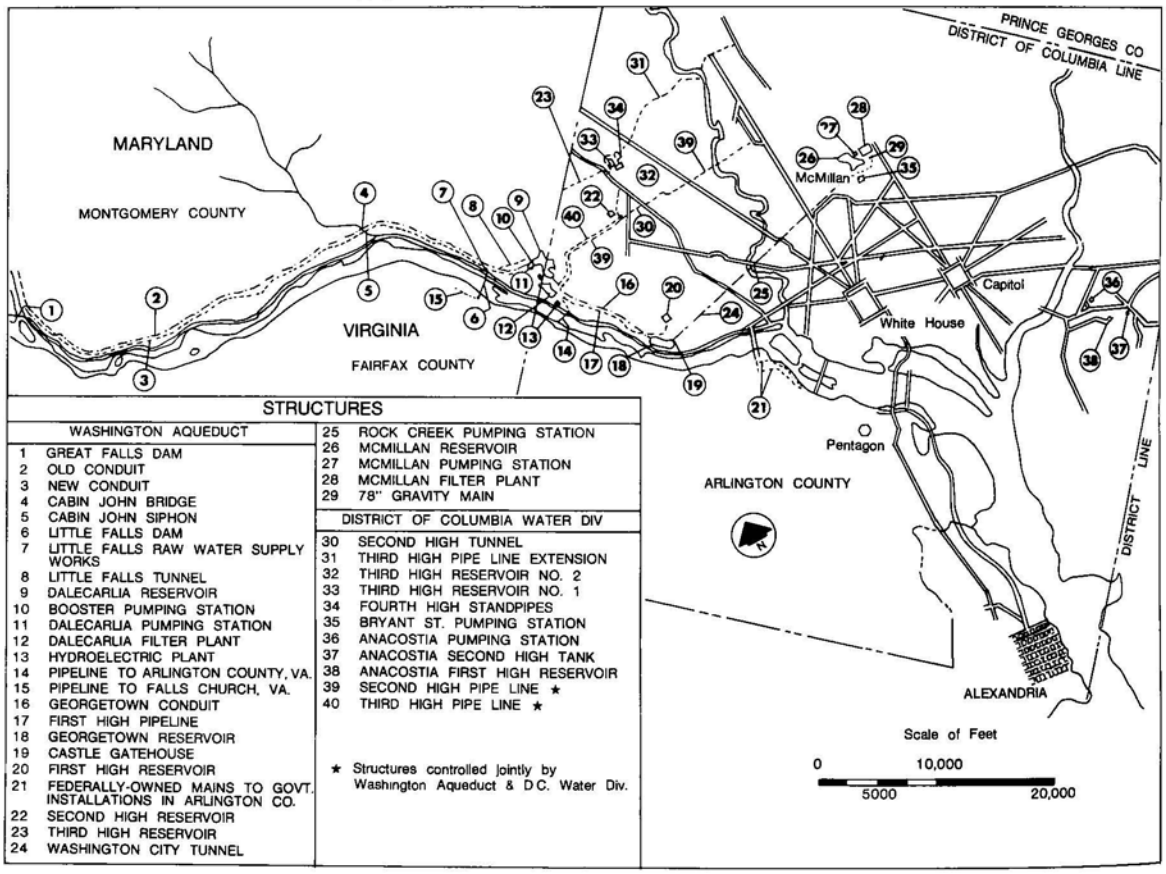
supervisor of Baltimore harbor, the Baltimore Engineer District coordinates the activities of local agencies in their efforts to prevent pollution of the Patapsco River and other streams. This requires inspecting all industrial and commercial plants at and near the shore line in all tidal waters within the state of Maryland.

Oil has become a major contributor to pollution. In 1958, about one mile of waterfront on the west side of Chesapeake Bay was damaged when the incoming tide carried oil onto the beach. Leakage from oil-storage plants caused part of the trouble, along with the uncontrolled and undisguised dumping of bilge oil into the main ship canal. Plant conversions and more frequent patrolling have been instituted to alleviate the most destructive effects of this continuing menace.[36]

V

Since 1956, the Baltimore District has been formulating broad-range river-basin planning for the waters under its control. It participated in the meetings of the Interstate Advisory Committee on the Susquehanna River along with the states of Maryland, New York and Pennsylvania plus the federal departments of Agriculture, Commerce, Health, Education and Welfare, Housing and Urban Development, Interior and the Federal Power Commission. Dr. Maurice K. Goddard, Secretary of the Department of Forests and Waters of Pennsylvania, chaired the committee which eventually led to the formation of a Susquehanna River Commission. John T. Starr, Chief of Civil Works Planning, represented the Baltimore Engineer District. The Commission examined all aspects of life in the Susquehanna River basin in an effort to adopt a comprehensive design which considers environmental quality, regional development and economic efficiency. The report stresses long-range planning instead of a haphazard approach to the adoption of federal flood-control and water-supply projects. The Corps reports directly to the Commission on any

General Location of Structures, Water Supply, District of Columbia



plans it has for directly or indirectly altering the waters of the basin.[37]

The Corps of Engineers began a study of the Potomac River basin in 1956 and came out with its final plan in 1963. In order to meet the projected water-supply needs of the entire Potomac basin through the year 2010, particularly of the Washington, D.C. metropolitan area, the report recommended the construction of sixteen major dam and lake projects for water storage. Peak water demand in Washington is higher than the river's flow during low-water periods. The plan was met by a storm of objections because it would have required, purchasing large tracts of land, relocating families, converting free-flowing streams into lakes, flooding farmland, woodland and wildlife habitats—including the old Chesapeake and Ohio Canal—and changing the nature of aquatic life from stream to lake species. Conservation groups organized a protest against the plan and succeeded in preventing its full implementation. The problem of meeting the city's water-supply needs has yet to be solved.[38]

The River and Harbor Act of 1965 authorized the Corps to completely investigate water use and control in the Chesapeake Bay basin. This endeavor includes constructing a hydraulic model of the bay in order to measure temperature change, current speeds and directions, tidal elevations and salinity. The model building covers fourteen acres at Matapeake, Maryland, on the shoreline of Kent Island. The model is a formed concrete slab with the bay's topography reproduced by masonite templates designed by the Waterways Experiment Station at Vicksburg, Mississippi.

The model can simulate one year of real time in about four days. To verify data duplicated in the model, the government let contracts with the University of Maryland, The Johns Hopkins University, the Virginia Institute of Marine Science, and the National Ocean Survey, to measure tidal elevations, current velocities and salinities at many places in the bay. The ultimate goal of the study, as the Baltimore District Engineer, Col. Robert S. McGarry, said in a speech before the Engineering Society of Baltimore in October 1973, "will be a water-land management program that will provide decision makers with the information necessary to plan for the development of this region without destroying the beauty and dignity of Chesapeake Bay."[39]

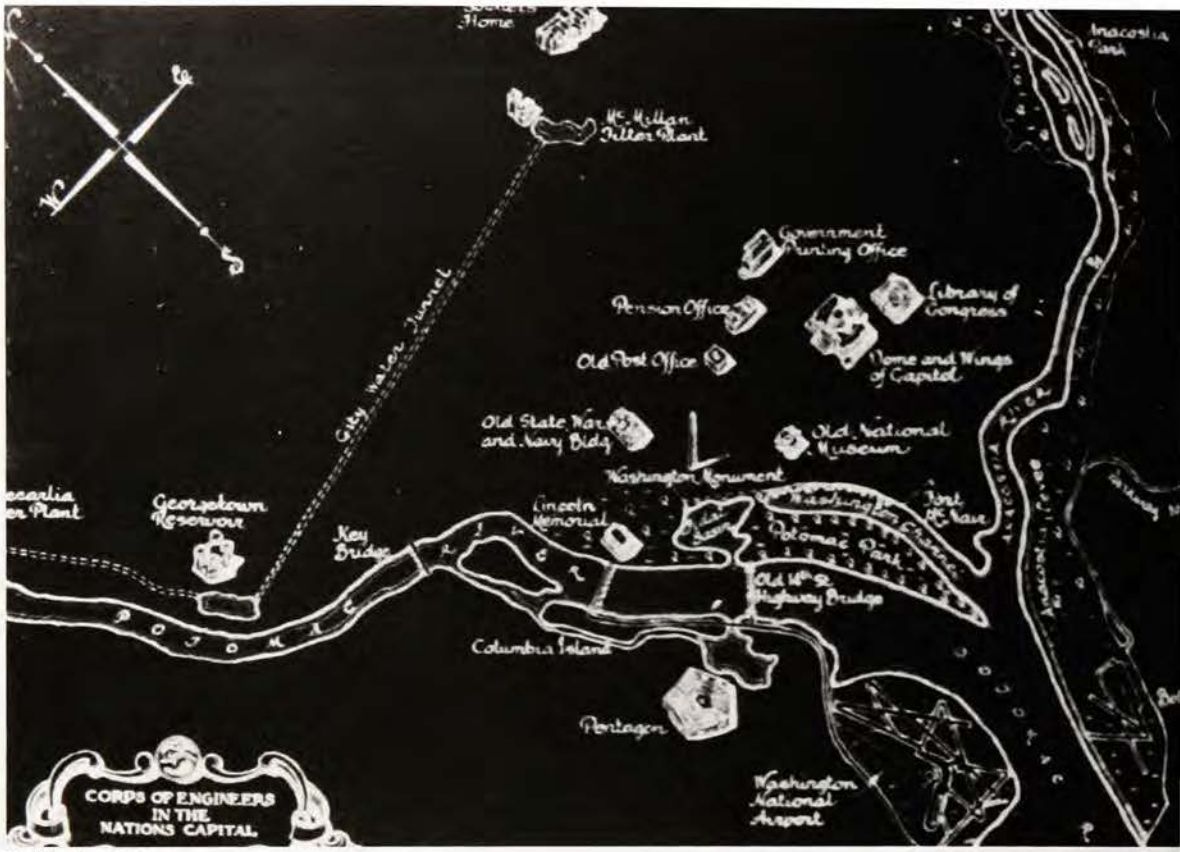
VI

The Corps of Engineers has many other diverse civil tasks besides flood control, improving and regulating navigation, and studying river basins. Since 1961, the Baltimore District has been in charge of water supply for Washington and vicinity, especially operating the Washington Aqueduct. Construction of the aqueduct began in 1853 under the supervision of Capt. Montgomery C. Meigs who in ten years completed a conduit from Great Falls to Georgetown Reservoir. The nine-foot conduit brought an ample supply of Potomac River water to the capital, but eventually the distribution mains proved too small to supply a rapidly growing population.

In 1901, Congress approved an important advance in the water-supply system for Washington by authorizing a seventy-five million-gallon-a-day slow sand filtration plant at McMillan. Placed in service in 1905, it provided the city with clear water for the first time. During the 1920's, the Corps of Engineers expanded the facilities by building a new conduit from Great Falls to Dalecarlia, a filtration plant at Dalecarlia and various transmission mains and storage reservoirs. The additions doubled the city's safe-water reserves. The army built the new conduit parallel to the old one with three interconnections so that sections of either conduit could be drained for repairs without closing down the entire system.

In 1935 the Engineers erected a booster pumping station at the north end of the Dalecarlia Reservoir to provide a heavier flow of water from the conduits to the filters. More additions after World War II included expanding the filtration and pumping facilities at the McMillan and Dalecarlia stations. Fluoride was added to the water in 1952.

During the 1960's the Baltimore district managed the construction of new filtration, chemical and administration buildings at Dalecarlia and of a new chemical building for the McMillan plant. Daily operations include administering, maintaining and protecting the water-supply system as well as planning, engineering and constructing these additions and improvements. In 1972 the Washington



Washington area

Dalecarlia Laboratory, Filtration Plant, Washington Aqueduct

Aqueduct supplied 74,322 million gallons of water to the Washington metropolitan area, daily consumption averaging 203 million gallons.[40]

Diversification in the Baltimore District's civil works is also manifested by its establishment of emergency radio facilities. Before World War II, all oral communication between the District and its field offices was by telephone. Having no radio back up proved disastrous during the Susquehanna River flood of 1936 when raging waters destroyed telephone lines in many places. After 1945, the Corps of Engineers decided to install excess communications equipment in its districts to help coordinate civil-works functions. The Baltimore District assigned Willard J. Prentice, a civil engineer in its Flood Control Branch, to organize the District's radio communications system. The first two stations at Whitney Point Dam in New York and Indian Rock Dam in Pennsylvania began

operations on 14 March 1948 in conjunction with the Susquehanna Emergency Network. Soon thereafter the District installed stations at Fort McHenry, at East Sidney and Almond Dams in New York; and at District headquarters in downtown Baltimore. Since then the system has been expanded and equipment has improved to provide essential and reliable communications, particularly during emergencies.[41]

VII

The most noteworthy achievements of the Baltimore District during recent years have been in disaster relief. Because of its decentralized organization, its regional offices have been able to cope most effectively with problems on the scene in times of crises. As the center of the Middle Atlantic region's major drainage area that includes large and important population centers, the Baltimore District has had great demands placed upon it to aid people stricken by storms, hurricanes and resulting floods. Whenever emergencies have arisen such as the hurricane floods of 1955, the coastal storm of 1962, the Susquehanna River Basin flood in 1964 or the calamitous Hurricane Agnes in 1972 the Baltimore District has moved swiftly to rescue people and property from further destruction and to aid in repairing damage.

Within twenty-four hours after Hurricane Diane struck in August 1955, the Baltimore District had crews in the field helping to restore communications, clear debris and clean up river channels. In the wake of the violent tempest which hit the Atlantic Coast between 6 and 8 March 1962, the Baltimore District undertook its "Operation Five High" to reconstruct sand dunes to help protect against severe tides and high water. The Corps chose this code name for the mission to symbolize the unusual occurrence of five successive high tides which accompanied the March storm. During those three days in March practically the entire barrier beach in Maryland was under water at some time from high tides and waves that ranged ten to fifteen feet high.

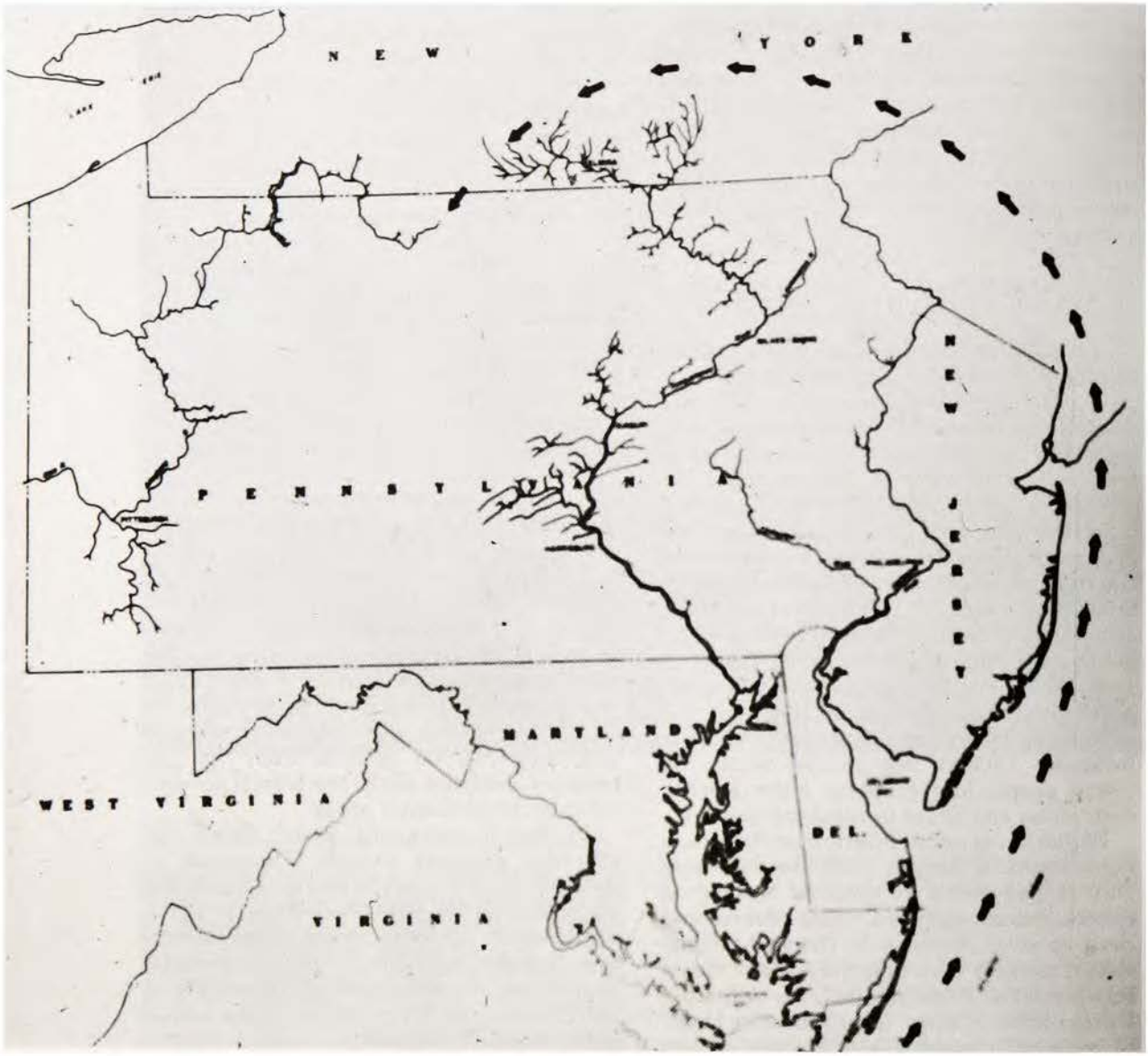
Immediately after that storm the District, acting on requests from the Office of Emergency Planning, activated its Disaster Control Center to determine the damage to seawalls, sand dunes, dikes, boardwalks, piers and beaches. Restoring the dune line, begun during the summer, was delayed by storms in September and November. Finally, by the end of the year, two hydraulic pipeline dredges had pumped enough sand from the back-bay area onto the damaged beach to form a protective twelve-foot dune barrier.[42]

Heavy rains during the spring of 1964, joined by melting snow, caused flooding in the Susquehanna River basin, especially along the North and West Branches. Damage totaled $19 million. Throughout the crisis the Baltimore District advised and assisted local communities while it lowered flood crests at downstream damage centers by closing gates at Almond, Whitney Point and East Sidney dams in New York and at Stillwater, Alvin R. Bush and George B. Stevenson Dams in Pennsylvania.[43]

Of all the violent tropical storms that hit the eastern seaboard of the United States during the twentieth century, Hurricane Agnes left the most devastation. Between 14 and 23 June 1972, more than one hundred persons lost their lives as the rains continued to pour and flood waters swept away homes, farms and businesses. Damage was estimated at more than $3 billion. During the emergency, governmental and volunteer agencies evacuated 387,000 persons from the 233 counties and cities which the federal government declared disaster areas.

In the Susquehanna basin, floods far exceeded previous records. Thousands of volunteers tried vainly to stave off the raging Susquehanna River at Wilkes-Barre, Pennsylvania, with sandbag levees, but waters engulfed the city. In the Potomac River basin destruction was also extensive, principally on the Shenandoah River and the lower half of the Potomac. The storm released massive quantities of fresh water into Chesapeake Bay drainage basin that carried record loads of silt, debris, chemicals, bacteria and sewage. All these swept into the upper reaches of the bay and its tributaries, causing abrupt changes in salinity, oxygen, temperature, tidal circulation and sediments.

In response to the crisis the Baltimore District immediately dispatched rescue and survey teams to the disaster areas. It rushed pumps and sandbags to Wilkes-Barre to help relieve that beleaguered town. Restoring public utilities became the first priority. By 27 June the Baltimore District had established



emergency offices at Wilkes-Barre, Harrisburg, Lock Haven, Sunbury, York, Lewistown and Towanda in Pennsylvania; at Annapolis, Ellicott City, Frederick and Havre de Grace in Maryland; at Alexandria, Richmond and Covington in Virginia; and at Martinsburg in West Virginia.

Because destruction in Pennsylvania was so massive, the Corps of Engineers eventually set up a temporary Susquehanna District, with a three-month life span, to administer disaster relief in that basin. This freed the Baltimore District to concentrate on flood relief in Maryland and Virginia and perform its normal duties throughout its area of jurisdiction.[44]

Harrisburg, Wilkes-Barre after tropical storm Agnes →

VIII

Overall, the Baltimore District of the Army Corps of Engineers has had a profound influence in developing the Middle Atlantic region. Since the 1930's its role has changed from relatively simple navigation improvements to managing flood control, dam construction, recreation, water supply and general resources. It has opened up water communication and erected flood works to protect population centers. The positive achievements are many. At the same time, in recent years environmentalists and conservationists have criticized ecologically destructive projects which neglect the natural balance in favor of economic development. As a result of the growing concern over the environment, Congress passed the National Environment Policy Act of 1969 which requires that an environmental impact statement be prepared in conjunction with all proposed federal projects. Col. Louis W. Prentiss, Jr., Baltimore District Engineer from 1 July 1971 to 30 June 1973, welcomed the new legal requirement to draft an environmental impact statement because "it made us really answer the kinds of questions that should have been answered a long time ago . . ."[45] Within the Baltimore District the Environmental Resources Branch located in the Planning Division compiles the impact statements independent of constraints from the Engineering and Construction Divisions. If a project is sound, from an engineering standpoint, but found to be environmentally detrimental, these findings will be reported directly to the District Engineer by the Chief of the Planning Division.

During the years ahead the District will continue to be a dynamic force in the Middle Atlantic community. While traditional construction activities in civil works remain more important than ever before, the District is becoming more and more engaged in environmental enhancement and recreation, particularly in the Susquehanna Valley. As its history has shown, it has been a continually changing organization at the center of important issues that face society at large, from improving transportation over land and water, to flood protection and disaster relief and today, environmental control. The question of what restraints will have to be placed on economic growth in the future in order to

preserve the ecological balance cannot be answered by the Corps of Engineers alone. The issue goes to the very foundation of the American economic and social structure. Ultimately the society as a whole will have to decide where it wishes to place its greatest value.

Footnotes to Chapter X

[1]Ltr, Schley to Sen George L. Radcliffe of Md, 28 Feb 1940. Recs of Baltimore Engr Dist, Washington Nat Rec Ctr, Suitland Md. Rec Gp 77, ACC 71A939, box 43.

[2](1) Ltr, Dent to Albert C. Ritchie, Gov of Md, 15 Sep 1933. Rec Gp 77, ACC 71A939, box 46. (2) Ltr, Schley to Radcliffe, 6 Nov 1940. Rec Gp 77, ACC 71A939, box 47. (3) Annual Rpt, C of Engrs, 1972, vol. II, pp. 4-9, 4-10.

[3]The Baltimore District Engineer and the South Atlantic Division recommended against this improvement on the ground that it would benefit only local interests. The Board of Engineers for Rivers and Harbors and Maj. Gen. Edward M. Markham, Chief of Engineers, overruled these judgments and found the project warranted by the prospective benefits to the important sea-food industry of the region. Ltr, Markham to Woodring, 24 Mar 1937. Rec Gp 77, ACC 71A939, box 42.

[4]Ltr, Rhea to Spiro T. Agnew, Gov of Md, 11 Oct 1967. Recs of Baltimore Engr Dist; Mailing and Rec Br, box 117. (2) Annual Rpt, C of Engrs, 1972, vol. II, pp. 4-6.

[5]Rpt, Board of Engrs for Rivers and Harbors, 13 Feb. 1939. Rec Gp 77, ACC 71A939, box 40.

[6](1) Ltr, Maj P.E. Bermel, Mil asst to Baltimore Dist Engr, to Markham, 1 Feb 1937. (2) Rpt, Bd of Engrs for Rivers and Harbors, 25 Sep 1939. Rec Gp 77, ACC 71A939, box 48.

[7](1) Ltr, Markham to Sec War, 5 Oct 1936. (2) Ltr, Capt H. T. Miller to Commissioners of Anne Arundel Co, 27 Aug 1938. Rec Gp 77, ACC 71A939, box 39. (3) Annual Rpts, C of Engrs, 9 Oct 1939, p. 447; 11 Oct 1940, pp. 444-46, 449; 31 Oct 1941, pp. 429, 432; 31 Oct 1942, p. 387.

[8]*Ibid.*, 1972, vol. II, pp. 4-11, 4-12.

[9](1) *Ibid.*, 1965, vol. II, p. 245; 1968, vol. II, p. 191. (2) Ltr, Col Roy S. Kelley, Baltimore Dist Engr, to Md St Sen Edward T. Hall, 22 Jul 1963. Recs of Baltimore Engr Dist; Mailing and Recs Br, box 94.

[10]Annual Rpts, C of Engrs, 9 Oct 1939, pp. 440-41; 30 Oct 1943, p. 350; 31 Oct 1947, p. 446; 31 Aug 1948, p. 490; 1957, vol. II, p. 295; 1958, vol. II, p. 262.

[11]*Ibid.*, 1957, vol. II p. 300; 1967, vol. II, p. 255; 1969, vol. II, p. 172; 1972, vol. II, pp. 4-7, 4-8, 4-9. (2) Survey Report on Neabsco Creek, 30 Apr 1971. Recs of Baltimore Engr Dist; Mailing and Rec Br, box 173. (3) Ltr, Col W. J. Love, Baltimore Dist Engr, to Sen William B. Spong, Jr., of Va, 13 Apr 1971. Records of Baltimore Engr Dist; Mailing and Rec Br, box 156. (4) Despite the large number of navigation projects in Maryland and Virginia the Baltimore District, after surveys, rejected far many more projects than it finally recommended for approval.

[12]Rpt, Bd of Engrs for Rivers and Harbors on Potomac River at and below Washington, D.C., 5 Apr 1966. Recs of Baltimore Engr Dist; Mailing and Rec Br, box 118. (2) Annual Rpts, C of Engrs, 1963, vol. II, p. 291; 1972, vol. II, pp. 4-14.

[13]*Ibid.*, 1972, vol. II, pp. 4-10, 4-11.

[14]L. C. Gottschalk, "Effects of Soil Erosion on Navigation in Upper Chesapeake Bay," *Geog Rev*, XXXV (Apr 1945), p. 236.

[15]Ltr, Ernst to Brig Gen John M. Wilson, C of Engrs, 19 Jan 1901. Rec Gp 77, entry 985, vol. VIII.

[16]Ltr, Hains to Gillespie, 8 Dec 1902. Rec Gp 77, entry 985, vol IX.

[17]The fire, which started on the morning of Sunday, 7 Feb 1904, in forty hours destroyed more than 140 acres of commercial property, including 1,343 separate buildings. Francis F. Beirne, *The Amiable Baltimoreans* (New York: E. P. Dutton & Co., 1951), pp. 338-339.

[18](1) Francis F. Beirne, *Baltimore: A Picture History*, p. 97. (2) Inspector Albert Mott, Report on the History of the Project for a 35' Channel from Baltimore to the Sea, 24 Dec 1904. (3) Ltr, Baltimore Merchants and Mfrs Assn to Hoxie, 13 Apr 1905. (4) Ltr, Baltimore Bd of Trade to Hoxie, 17 Apr 1905. (5) Ltr, Baltimore Chamber of Commerce to Hoxie, 19 Apr 1905. Rec Gp 77, entry 994, box 9. (6) Ltrs, Hains to Gillespie, 10 Jul and 5 Aug 1902. Rec Gp 77, entry 985, vol. IX. (7) Annual Rpts, C of Engrs, 31 Aug 1948, p. 444; 28 Sep 1904, pp. 180-81; 29 Sep 1905, p. 187.

[19]*Ibid.*, 28 Sep 1915, p. 387; 5 Oct 1916, p. 421.

[20]Ltr, Hains to Gillespie, 11 Dec 1902. Rec Gp 77, entry 985, vol. IX.

[21]*Baltimore American*, 25 Sep 1906. Rec Gp 77, entry 994, box 9.

[22]Baltimore Engr Dist, *Review Report: Baltimore Harbor and Channels* (Jun 1969), pp. 21-22.

[23]Annual Rpt, C of Engrs, 5 Oct 1922, p. 523.

[24]*Ibid.*, 22 Sep 1932, p. 394.

[25]Dent, Rpt on Baltimore Harbor, 3 Jun 1933. Rec Gp 77, ACC 71A939, box 39.

[26]U.S. Army, Index to Rpts of C of Engrs, vol. I, p. 366. (2) CE, *Baltimore Harbor and Channels*. H. Doc. 741, 79th Cong., 2nd sess., 1947, p. 25. (3) The tonnage passing through the port of Baltimore generally expanded each year during the period 1900-36, with a drop-off during the war years 1917-19 and the Depression years 1922 and 1930-34. (4) See also CE, *Baltimore Harbor and Channels*. H. Doc. 29, 71st Cong., 1st sess., 1929, p. 19.

[27](1) U.S. Chesapeake and Delaware Canal Commission, Waterway to Connect Waters of Chesapeake and Delaware Bays. S. Doc. 215, 59th Cong., 2nd sess., 1907. (2) U.S. Congress, H.R. Comm on Railways and Canals. Hearings on Chesapeake and Delaware Canal, 1908, 1909. (3) U.S. Congress Senate Subcomm of Comm on Coast and Insular Survey, 21, 24, 28, and 31 Mar 1914. (4) U.S. Congress, H.R. Comm on Rivers and Harbors. Hearings on Purchase of Chesapeake and Delaware Canal, 15 Jan 1914. (5) WD, Proposed Acquisition of Chesapeake and Delaware Canal. S. Doc. 14, 64th Cong., 1st sess., 1915. (6) U.S. Congress H.R. Comm on Rivers and Harbors. Hearings on Purchase and Improvement of Chesapeake and Delaware Canal, 6 Jan 1917 and 16 Dec 1918. (7) For a detailed account of the debate to transform the Chesapeake and Delaware Canal into a modern ship waterway, see Ralph D. Gray, *The National Waterway: A History of the Chesapeake and Delaware Canal, 1769-1965* (Univ. of Ill. Press, 1967), pp. 216-239.

[28]U.S. Congress, H.R. Comm on Rivers and Harbors. Hearings on Continuing the Improvement of the Chesapeake and Delaware Canal, 31 Jan and 1 Feb 1934.

[29]U.S. Engr Dept, Philadelphia Office, *The Chesapeake and Delaware Canal* (1 May 1941), pp. 23-24.

[30]Gray, *The National Waterway*, pp. 251, 257.

[31](1) Ltr, Maj Gen Eugene Reybold, C of Engrs, to Chmn, H. R. Comm on Rivers and Harbors, 30 Jun 1942. Ltr, Sec War Henry L. Stimson to Speaker of House, 11 Mar 1943. Rec Gp 77, ACC 71A939, box 39.

[32]Lt, Lt Col Oscar J. Pool, Baltimore Dist Engr, to Div Engr, 9 Aug 1943. Rec Gp 77, ACC 71A939, box 39.

[33]Annual Rpt, C of Engrs, 1955, vol. II, pp. 187-88.

[34]*Ibid.*, 1963, vol. II, p. 278; 1964, vol. II, p. 249; 1965, vol. II, p. 239; 1966, vol. II, p. 239; 1967, vol. II, p. 253; 1968, vol. II, p. 189; 1969, vol. II, p. 171.

[35]*Ibid.*, 1972, vol. II, pp. 4-2, 4-3.

[36]PAO, Baltimore Engr Dist, "Brief of Supervisor Activities in the Harbor of Baltimore" (Jan 1965). Recs of Baltimore Engr Dist; PAO, box 1. (2) For a complete discussion on the evolution of the Refuse Act, see Albert E. Cowdrey, "Pioneering Environmental Law: The Army Corps of Engineers and the Refuse Act," *Pacific Hist Rev*, XLVI (Aug 1975), pp. 331-49.

[37]Susquehanna River Basin Study Coordinating Committee, *Susquehanna River Basin Study, Summary* (Jun 1970).

[38]CE, *Potomac River Basin Report*, vol. I. H. Doc. No. 91-343, 91st Cong., 2nd sess., (Washington: GPO, 1970).

[39](1) Col Robert S. McGarry, speech before Engineering Soc of Baltimore, 17 Oct 1973. Recs of Baltimore Engr Dist; PAO, box 4. (2) *Washington Post*, 2 Jan 1975, pp. E1-3.

[40]PAO, Baltimore Engr Dist, "Construction of the Washington Aqueduct Water System for the District of Columbia," n.d. Recs of Baltimore Engr Dist; PAO, box 4. (2) Annual Rpt, C of Engrs, 1972, vol. II, pp. 4-27, 4-28, 4-29.

[41]Baltimore Engr Dist, A History of Radio Communications in the Baltimore District, pp. 1-10.

[42]Baltimore Engr Dist, "Operation Five High" (Dec 1962). Recs of Baltimore Engr Dist; Mailing and Rec Br, box 94. (2) John L. Reynolds, Ch, Ops Div, Report on Coastal Storm of 26-28 Nov 1962. Recs of Baltimore Engr Dist; Mailing and Recs Br, box 146. (3) News release, Baltimore Engr Dist, 23 Jul 1962. Recs of Baltimore Engr Dist; PAO, box 3.

[43](1) Annual Rpt, C of Engrs, 1964, vol. I, p. 61. (2) Baltimore Engr Dist, Activities in Pennsylvania, 1 Jul 1963 to 30 Jun 1964, p. 4. Recs of Baltimore Engr Dist; Hist Instal File.

[44](1) Annual Rpt, C of Engrs, 1972, vol. I, pp. 3-7. (2) U.S. Nat Weather Serv, Off of Meteorological Ops, Preliminary Reports on Hurricanes and Tropical Storms Hurricane Agnes, 14-23 Jun 1972 (Sep 1972). (3) Paul W. Warnagiris and John J. Rygiel, *The Great Flood of 1972* (Wyoming, Pa.: Observer-Rygiel Pub. Co., 1973). (4) U.S. Disaster Survey Team on the Events of Agnes, *Final Report* (Rockville, Md., 1973). (5) The Susquehanna District, headed by Col John F. McElhenny, existed from 17 July 1972 to 30 November 1972.

[45]Interv, Kanarek with Prentiss, 9 Aug 1974.

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Entry 971-Letters Sent Relating to Rivers and Harbors, Aug 5, 1884-Jan 29, 1836.

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Appendix A

Glossary

Actg	Acting
Aff	Affairs
AG	Adjutant General
Amer	American
Arch	Archeological
Arty	Artillery
Atty	Attorney
Bd	Board
Biog	Biographical
Br	Branch
Bur	Bureau
CE	Corps of Engineers
CG	Commanding General
Ch	Chief
Chmn	Chairman
Co	Company; County
CO	Commanding Officer
CofEngrs	Chief of Engineers
Comm	Committee
Cong Rec	Congressional Record
Const	Construction
Ctr	Center
Dep	Deputy
Dept	Department
Dir	Director
Dist	District
Div	Division

doc.	document
Econ	Economic Geography
Engr(s)	Engineer(s)
Exec	Executive
Ft	Fort
FY	fiscal year
GAO	General Accounting Office
Geog Rev	Geographical Review
Gp	Group
GPO	Government Printing Office
H. Doc.	House (of Representatives) Document
Hist	Historical; History
H.R.	House of Representatives
Instal	Installation(s)
Interv	Interview
Jnl Econ Hist	Journal of Economic History
Jr Engr	Junior Engineer
Lib Cong	Library of Congress
Ltr	letter
Mgt	Management
Mil	Military
MS	Manuscript
Nat	National
n.d.	no date
OCE	Office of the Chief of Engineers
Off	Office
Ops	Operations
Ord Sgt	Ordnance Sergeant
OTAG	Office of The Adjutant General
OTQMG	Office of The Quartermaster General
PAO	Public Affairs Office
Pol	Political
PostMG	Postmaster General
Proj	Project
Pt	Part
Rec	Record
Regs	Regulations
Rep	Representative
rev.	revised
Rpt	Report
S. Doc.	Senate Document
sec.	section
Sec	Secretary
Sec Army	Secretary of the Army
Sec Navy	Secretary of the Navy
Sec Treas	Secretary of the Treasury
Sec War	Secretary of War
Sen	Senate; Senator
Serv	Service(s)
Soc	Society

St	State
sub	subject
Subcomm	Subcommittee
Supt	Superintendent
Telg	Telegram
TLO	Technical Liaison Office
Topo Bur	Topographical Bureau
VP	Vice President
WD	War Department

Appendix B

Corps of Engineer Officers Who Have Served in the Baltimore Area Since 1847.

Project Engineers

Major Cornelius A. Ogden	1847—20 Jul 1848
Captain Robert E. Lee	21 Jul 1848—31 Oct 1852
Captain Henry Brewerton	1 Sep 1852—5 Nov 1864
Colonel J D. Graham (Temp)	1 Aug 1864—28 Dec 1865
Major William P Craighill	10 Nov 1865—24 Sep 1867
Major J. G. Parke (Acting)	25 Sep 1867—1 Jun 1868
Colonel J. H. Simpson	2 Jun 1868—6 Nov 1870
Major William P Craighill	7 Nov 1870—30 Mar 1889
Captain Thomas Turtle (Temp)	1 Apr 1889—23 Jul 1889
Lt. Colonel W. P. Craighill	24 Jul 1889—18 May 1895
Colonel Peter C. Haines	19 May 1895—22 Oct 1897
Lt. Charles W. Kutz (Temp)	23 Oct 1897—1 Apr 1898
" " " "	10 Jun 1898—30 Sep 1898
Colonel Peter C. Haines	1 Oct 1898—14 Apr 1900
Lt. Colonel O. H. Ernst	15 Apr 1900—31 Jul 1901

District Engineers

Colonel Peter C. Haines	1 Aug 1901—31 Mar 1903
Lt. Colonel Allen (Temp)	1 Apr 1903—9 Jun 1903
Colonel W. A. Jones	10 Jun 1903—30 Nov 1903
Colonel Richard L. Hoxie	1 Dec 1903—14 Jul 1908
Lt. Colonel William E. Craighill	15 Jul 1903—31 Jan 1910
Colonel Thomas L. Casey, Jr.	1 Feb 1910—21 Dec 1911
Lt. Colonel William C. Langfitt	22 Dec 1911—20 Aug 1912

Lt. Colonel Lansing H. Beach	21 Aug 1912—31 Jul 1915
Major Horton W. Stickle	1 Aug 1915—30 Sep 1915
Colonel John Biddle	1 Oct 1915—10 Jun 1916
Lt. Colonel Clement A. F. Flagler	11 Jun 1916—3 Aug 1916
Lt. Colonel William V. Judson	4 Aug 1916—30 Apr 1917
Colonel Walter L. Fisk	1 May 1917—24 Sep 1917
Mr. John S. Doyle (Acting)	25 Sep 1917—30 Jun 1918
Mr. G. W. T. Miller (Acting)	1 Jul 1918—17 Jan 1919
Mr. John S. Doyle (Acting)	18 Jan 1919—19 Mar 1919
Colonel James J. Loving	20 Mar 1919—14 Oct 1919
Colonel James C. Sanford	15 Oct 1919—30 Apr 1920
Lt. Colonel James P. Jervey	1 May 1920—21 Sep 1920
Major Edward M. Johnston	22 Sep 1920—31 Dec 1920
Major Francis C. Harrington	1 Jan 1921—7 Jul 1924
Major Joseph C. Mahaffey	8 Jul 1924—6 Apr 1925
Major James A. O'Connor	7 Apr 1925—31 May 1925
Major Charles R. Pettis	1 Jun 1925—28 Apr 1929
Lt. Colonel Warren T. Hannum	29 Apr 1929—3 Oct 1931
Major Joseph d. Arthur, Jr.	4 Oct 1931—1 Feb 1932
Colonel Elliot J. Dent	2 Feb 1932—4 Aug 1937
Colonel William A. Johnson	3 Aug 1937—31 Oct 1940
Lt. Colonel Holland L. Robb (Acting)	1 Nov 1940—5 Jan 1941
Colonel Frank C. Boggs, Jr.	6 Jan 1941—25 Jan 1942
Colonel Conrad P. Hardy	26 Jan 1942—30 May 1943
Colonel Oscar J. Poole	31 May 1943—2 Aug 1945
Colonel Wallace M. Allison	3 Aug 1945—31 Oct 1946
Colonel John S. Seybold	1 Nov 1946—6 Aug 1947
Lt. Colonel Jack P. Campbell (Acting)	7 Aug 1947—15 Aug 1947
Colonel William W. Wanamaker	7 Aug 1947—1 Sep 1948
" " " " (Acting)	2 Sep 1948—12 Sep 1948
Colonel Alvin C. Welling	13 Sep 1948—18 Jul 1951
Colonel Reginald Whitaker	19 Jul 1951—31 Aug 1954
Colonel Stephen E. Smith	1 Sep 1954—27 Feb 1957
Lt. Colonel Edward J. Ribbs (Acting)	8 Jan 1957—27 Feb 1957
Colonel Stanley T. B. Johnson	28 Feb 1957—29 Jul 1960
Colonel Warren R. Johnson	30 Jul 1960—9 Aug 1962
Colonel Roy S. Kelley	10 Aug 1962—2 Jun 1965
Lt. Col. Vincent I. Perricelli (Acting)	3 Jun 1965—5 Jul 1965
Colonel Frank W. Rhea	6 Jul 1965—16 Jun 1968
Lt. Colonel J. A. Eagers, Jr. (Acting)	17 Jun 1968—30 Jun 1968
Colonel W. J. Love	1 Jul 1968—30 Jun 1971
Colonel Louis W. Prentiss	1 Jul 1971—30 Jun 1973
Colonel Robert S. McGarry	1 Jul 1973—30 Jun 1976
Colonel G. K. Withers	1 Jul 1976—

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